```
with(Statistics) :
with(plots) :
with(LinearAlgebra) :
with(SignalProcessing) :

printlevel := 4 :


ZPi := 3.14159265358979323846264338327950
```

$$ZPi := 3.14159265358979323846264338327950 \quad (1)$$

```
# INPUT Data P(A | M)

#
    ##########################################################################################
    ##############################################
# ############################################################
############################################################
# Berechnung P(M|A) aus Table 4 für P(A|M) in OLZE 2012 Third molars
# ############################################################
############################################################
# ############################################################
############################################################


# ############################################################
#Bestückung der Matrix X  ##################################################
# ################### ############## Also: N =279  − 12 = Tab 4:p872:  Non impacted 3-rd
    molars ##############################################
#
    ##########################################################################################
    ##################################################
# ######################Spalte 1: Tooth; 2: Stage; 3: N; 4: Min; 5: Max; 6: Mean; 7: SD; 8:LQ;
    9:Median; 10: UQ ###################################
#
    ##########################################################################################
    ########################################################################
# M = m1
X := Matrix( [ [18, 1, 11, 10.29, 15.72, 13.21, 1.49, 12.14, 13.05, 14.13 ],
 [18, 2, 14, 13.07, 19.73, 15.57, 2.04, 13.67, 15.09, 17.03 ],
 [18,  3, 22, 12.83, 23.09, 17.86, 2.34, 16.46, 17.37, 19.35 ],
 [18, 4, 45, 15.57, 26.73, 20.95, 2.62, 18.82, 21.00, 22.94 ],
 [18,  5, 282, 17.06, 26.95, 22.68, 2.15, 21.27, 22.78, 24.31 ],
[28, 1, 13, 10.29, 15.20, 13.39, 1.47, 12.42, 13.34, 14.80 ],
```

```
[28, 2, 11, 12.14, 18.46, 14.94, 2.06, 13.52, 14.17, 16.80],
[28, 3, 26, 12.83, 23.09, 17.92, 2.43, 16.36, 17.66, 19.57],
[28, 4, 42, 15.57, 26.73, 20.49, 2.59, 18.52, 20.44, 22.54],
[28, 5, 288, 17.38, 26.95, 22.76, 2.12, 21.27, 22.87, 24.36],
 [38, 3, 20, 12.83, 21.86, 18.43, 2.35, 16.63, 18.21, 20.54],
[38, 4, 23, 17.61, 25.17, 20.73, 2.10, 19.14, 20.10, 22.49],
[38, 5, 217, 17.38, 26.95, 22.80, 2.02, 21.32, 22.88, 24.32],
 [48, 3, 19, 12.83, 23.43, 18.48, 2.54, 16.74, 18.39, 20.37],
[48, 4, 30, 15.77, 24.88, 20.25, 2.17, 18.53, 20.00, 21.74],
[48, 5, 225, 17.38, 26.91, 22.91, 1.96, 21.39, 23.12, 24.41]]) :


#
    ##########################################################################################
    ##############################################
# ####################################################################
####################################################################
# Berechnung P(M|A) aus OLZE 2008 Studies wisdom tooth eruption German pp.426-429
# ####################################################################
####################################################################
# ####################################################################
####################################################################

 interface(rtablesize = 100)
                                        100                                              (2)
NM1 = 4;
                                      NM1 = 4                                            (3)

# ####################################################################
#Bestückung der Matrix X  ##################################################
# #################### ############### Also: N =144    Tab 2:p427:  Non impacted 3-rd molars
    ################################################
#
    ##########################################################################################
    #####################################################
# #####################Spalte 1: Tooth; 2: Stage; 3: N; 4: Min; 5: Max; 6: Mean; 7: SD; 8:LQ;
    9:Median; 10: UQ ####################################
#
    ##########################################################################################
    ##########################################################################

X := Matrix([[18, 1, 14, 14.7, 24.9, 18.9, 3.4, 15.5, 18.3, 21.9],
 [18, 2, 32, 14.9, 25.7, 20.8, 2.7, 19.7, 21.2, 22.9],
 [18, 3, 15, 18.7, 25.8, 22.1, 2.3, 20.1, 21.3, 24.2],
 [18, 4, 31, 19.0, 26.9, 23.4, 2.3, 21.9, 24.0, 25.2],
 [28, 1, 13, 15.0, 26.1, 18.8, 3.3, 15.5, 18.5, 21.0],
 [28, 2, 34, 14.7, 25.7, 21.2, 3.0, 19.5, 21.7, 23.3],
 [28, 3, 14, 20.0, 5.2, 21.4, 1.5, 20.4, 20.9, 22.4],
```

[28, 4, 33, 19.2, 26.9, 23.7, 2.2, 22.4, 24.5, 25.4],
[38, 1, 6, 14.7, 22.9, 18.6, 3.5, 15.1, 18.3, 22.2],
[38, 2, 17, 19.0, 26.1, 22.4, 2.0, 20.8, 22.5, 24.0],
[38, 3, 30, 20.0, 26.6, 22.8, 2.1, 21.2, 22.3, 24.7],
[38, 4, 27, 19.5, 26.9, 23.6, 2.1, 22.6, 24.0, 25.0],
[48, 1, 8, 14.7, 25.2, 19.9, 4.0, 15.7, 20.0, 23.9],
[48, 2, 27, 14.9, 26.6, 21.3, 2.9, 19.9, 21.9, 22.9],
[48, 3, 33, 18.7, 25.8, 22.7, 1.9, 21.4, 22.7, 24.2],
[48, 4, 25, 19.5, 26.9, 23.7, 2.2, 22.1, 24.2, 25.5]]) :

X

$$\begin{bmatrix} 18 & 1 & 14 & 14.7 & 24.9 & 18.9 & 3.4 & 15.5 & 18.3 & 21.9 \\ 18 & 2 & 32 & 14.9 & 25.7 & 20.8 & 2.7 & 19.7 & 21.2 & 22.9 \\ 18 & 3 & 15 & 18.7 & 25.8 & 22.1 & 2.3 & 20.1 & 21.3 & 24.2 \\ 18 & 4 & 31 & 19.0 & 26.9 & 23.4 & 2.3 & 21.9 & 24.0 & 25.2 \\ 28 & 1 & 13 & 15.0 & 26.1 & 18.8 & 3.3 & 15.5 & 18.5 & 21.0 \\ 28 & 2 & 34 & 14.7 & 25.7 & 21.2 & 3.0 & 19.5 & 21.7 & 23.3 \\ 28 & 3 & 14 & 20.0 & 5.2 & 21.4 & 1.5 & 20.4 & 20.9 & 22.4 \\ 28 & 4 & 33 & 19.2 & 26.9 & 23.7 & 2.2 & 22.4 & 24.5 & 25.4 \\ 38 & 1 & 6 & 14.7 & 22.9 & 18.6 & 3.5 & 15.1 & 18.3 & 22.2 \\ 38 & 2 & 17 & 19.0 & 26.1 & 22.4 & 2.0 & 20.8 & 22.5 & 24.0 \\ 38 & 3 & 30 & 20.0 & 26.6 & 22.8 & 2.1 & 21.2 & 22.3 & 24.7 \\ 38 & 4 & 27 & 19.5 & 26.9 & 23.6 & 2.1 & 22.6 & 24.0 & 25.0 \\ 48 & 1 & 8 & 14.7 & 25.2 & 19.9 & 4.0 & 15.7 & 20.0 & 23.9 \\ 48 & 2 & 27 & 14.9 & 26.6 & 21.3 & 2.9 & 19.9 & 21.9 & 22.9 \\ 48 & 3 & 33 & 18.7 & 25.8 & 22.7 & 1.9 & 21.4 & 22.7 & 24.2 \\ 48 & 4 & 25 & 19.5 & 26.9 & 23.7 & 2.2 & 22.1 & 24.2 & 25.5 \end{bmatrix} \quad \textbf{(4)}$$

$NM18 := 4;$
$NM28 := 4;$
$NM38 := 4;$
$NM48 := 4;$

$$NM18 := 4$$

$$NM28 := 4$$

$$NM38 := 4$$

$$NM48 := 4 \quad \textbf{(5)}$$

```
############################################################
# Berechnung von P(A | M=m) für alle m
# Normalannahme ==> E,S
############################################################


# Matrix für Gleichungssystem
G := Matrix(7, 2, 0.) :
# Ergebnisvektor E
E18 := Vector[column](NM18) :
S18 := Vector[column](NM18) :
E28 := Vector[column](NM28) :
S28 := Vector[column](NM28) :
E38 := Vector[column](NM38) :
S38 := Vector[column](NM38) :
E48 := Vector[column](NM48) :
S48 := Vector[column](NM48) :



for j from 1 to NM18 do
    S18(j) := X[j, 7] : E18(j) := X[j, 6] :
od:

E18; S18;
```

$$\begin{bmatrix} 18.9 \\ 20.8 \\ 22.1 \\ 23.4 \end{bmatrix}$$

$$\begin{bmatrix} 3.4 \\ 2.7 \\ 2.3 \\ 2.3 \end{bmatrix} \quad \textbf{(6)}$$

```
for j from NM18 + 1 to NM18 + NM28 do
    S28(j - NM18) := X[j, 7] : E28(j - NM18) := X[j, 6] :

od:
# G; S28;
```

for j **from** $NM18 + NM28 + 1$ **to** $NM18 + NM28 + NM38$ **do**
$S38(j - NM18 - NM28) := X[j, 7] : E38(j - NM18 - NM28) := X[j, 6] :$

od:

for j **from** $NM18 + NM28 + NM38 + 1$ **to** $NM18 + NM28 + NM38 + NM48$ **do**
$S48(j - NM18 - NM28 - NM38) := X[j, 7] : E348(j - NM18 - NM28 - NM38) := X[j, 6] :$

od:

$E18; S18;$

$$\begin{bmatrix} 18.9 \\ 20.8 \\ 22.1 \\ 23.4 \end{bmatrix}$$

$$\begin{bmatrix} 3.4 \\ 2.7 \\ 2.3 \\ 2.3 \end{bmatrix} \quad \textbf{(7)}$$

$E28; S28;$

$$\begin{bmatrix} 18.8 \\ 21.2 \\ 21.4 \\ 23.7 \end{bmatrix}$$

$$\begin{bmatrix} 3.3 \\ 3.0 \\ 1.5 \\ 2.2 \end{bmatrix} \quad \textbf{(8)}$$

$E38; S38;$

$$\begin{bmatrix} 18.6 \\ 22.4 \\ 22.8 \\ 23.6 \end{bmatrix}$$

$$\begin{bmatrix} 3.5 \\ 2.0 \\ 2.1 \\ 2.1 \end{bmatrix} \quad \textbf{(9)}$$

E48; *S48*;

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 4.0 \\ 2.9 \\ 1.9 \\ 2.2 \end{bmatrix} \quad \textbf{(10)}$$

 # Datenmatrix Alter OLZE 2008: Tab. 1 ####################
Spalte: 1: Alter, 2: Anz. Männer, 3: Anz. Frauen
interface(*rtablesize* = 100)

100 **(11)**

```
Y := Matrix( [ [12, 0, 13 ],
 [13, 0, 28 ],
 [14, 2, 33 ],
 [15, 5, 48 ],
 [16, 5, 45 ],
 [17, 1, 49 ],
 [18, 5, 41 ],
 [19, 11, 51 ],
 [20, 19, 39 ],
 [21, 22, 60 ],
 [22, 18, 31 ],
 [23, 18, 42 ],
 [24, 19, 33 ],
 [25, 14, 9 ],
 [26, 5, 0 ] ]) :

# Anzahl Alterseinträge
NA := 14;
```

$$NA := 14 \quad (12)$$

Gesamtzahl Männer <= P(A)

$NMenA := add(Y[i,2], i = 1..NA + 1);$

$$NMenA := 144 \quad (13)$$

Gesamtzahl Männer <=P(M)

$NMenM18 := add(X[j,3], j = 1..NM18);$

$$NMenM18 := 92 \quad (14)$$

$NMenM28 := add(X[j,3], j = NM18 + 1..NM18 + NM28);$

$$NMenM28 := 94 \quad (15)$$

$NMenM38 := add(X[j,3], j = NM18 + NM28 + 1..NM18 + NM28 + NM38);$

$$NMenM38 := 80 \quad (16)$$

$NMenM48 := add(X[j,3], j = NM18 + NM28 + NM38 + 1..NM18 + NM28 + NM38 + NM38);$

$$NMenM48 := 93 \quad (17)$$

##\
##

#!!!!!!!!!!!!!!!!!!!! ACHTUNG: AB HIER NA=21 UND AMin=9 WEGEN KOMPATIBILITÄT MIT CLAVICULA-STUDIE !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

##\
##

$NAAlt := 14$

$$NAAlt := 14 \quad (18)$$

$AMinAlt := 12;$

$$AMinAlt := 12 \quad (19)$$

$NA := 21$

$$NA := 21 \quad (20)$$

$AMin := 9;$

$$AMin := 9 \quad (21)$$

##

Berechnung P(M | A) mit:

$$\#\ P(M{=}m \mid A{=}a) = P(A{=}a \mid M{=}m)\cdot\frac{P(M=m)}{P(A=a)} = P(A{=}a \mid M{=}m)\cdot\frac{\frac{N(M=m)}{NM}}{\frac{N(A=a)}{NA}}$$

##

$PM18A := Matrix(NA, NM18, 0.):$
$PAM18 := Matrix(NM18, NA, 0.):$
$PM28A := Matrix(NA, NM28, 0.):$

$PAM28 := Matrix(NM28, NA, 0.)$:
$PM38A := Matrix(NA, NM38, 0.)$:
$PAM38 := Matrix(NM38, NA, 0.)$:
$PM48A := Matrix(NA, NM48, 0.)$:
$PAM48 := Matrix(NM48, NA, 0.)$:

$SPAM18 := Vector(NM18, 0.)$:
$SPAM28 := Vector(NM28, 0.)$:
$SPAM38 := Vector(NM38, 0.)$:
$SPAM48 := Vector(NM48, 0.)$:
$SPMA18 := Vector(NA, 0.)$:
$SPMA28 := Vector(NA, 0.)$:
$SPMA38 := Vector(NA, 0.)$:
$SPMA48 := Vector(NA, 0.)$:

$PM18 := Vector(NM18, 0.)$

$$PM18 := \begin{bmatrix} 0. \\ 0. \\ 0. \\ 0. \end{bmatrix} \quad \textbf{(22)}$$

$PM28 := Vector(NM28, 0.)$

$$PM28 := \begin{bmatrix} 0. \\ 0. \\ 0. \\ 0. \end{bmatrix} \quad \textbf{(23)}$$

$PM38 := Vector(NM38, 0.)$

$$PM38 := \begin{bmatrix} 0. \\ 0. \\ 0. \\ 0. \end{bmatrix} \quad \textbf{(24)}$$

$PM48 := Vector(NM48, 0.)$

$$PM48 := \begin{bmatrix} 0. \\ 0. \\ 0. \\ 0. \end{bmatrix} \quad \textbf{(25)}$$

$PA18 := Vector(NA, 0.):$
$PA28 := Vector(NA, 0.):$
$PA38 := Vector(NA, 0.):$
$PA48 := Vector(NA, 0.):$

for i **from** 1 **to** NA **do** *#Alter A*

for j **from** 1 **to** $NM18$ **do** *# Merkmal M*

$$\boldsymbol{PAM18}[j,i] := CDF(Normal(E18(j), S18(j)), convert(i+AMin+1, float)) - CDF(Normal(E18(j), S18(j)), convert(i+AMin, float)):$$

$$PM18[j] := \frac{convert(X[j,3], float)}{convert(NMenM18, float)}:$$

$$PA18[i] := PA18[i] + PAM18[j,i] \cdot PM18[j]:$$

od:

for j **from** 1 **to** $NM28$ **do** *# Merkmal M*

$$\boldsymbol{PAM28}[j,i] := CDF(Normal(E28(j), S28(j)), convert(i+AMin+1, float)) - CDF(Normal(E28(j), S28(j)), convert(i+AMin, float)):$$

$$PM28[j] := \frac{convert(X[j+NM18,3], float)}{convert(NMenM28, float)}:$$

$$PA28[i] := PA28[i] + PAM28[j,i] \cdot PM28[j]:$$

od:

for j **from** 1 **to** $NM38$ **do** *# Merkmal M*

$$\boldsymbol{PAM38}[j,i] := CDF(Normal(E38(j), S38(j)), convert(i+AMin+1, float)) - CDF(Normal(E38(j), S38(j)), convert(i+AMin, float)):$$

$$PM38[j] := \frac{convert(X[j+NM18+NM28,3], float)}{convert(NMenM38, float)}:$$

$$PA38[i] := PA38[i] + PAM38[j,i] \cdot PM38[j]:$$

od:

for j **from** 1 **to** $NM48$ **do** *# Merkmal M*

$$\boldsymbol{PAM48}[j,i] := CDF(Normal(E48(j), S48(j)), convert(i+AMin+1, float)) - CDF(Normal(E48(j), S48(j)), convert(i+AMin, float)):$$

$$PM48[j] := \frac{convert(X[j+NM18+NM28+NM38,3], float)}{convert(NMenM48, float)}:$$

$$PA48[i] := PA48[i] + PAM48[j,i] \cdot PM48[j]:$$

od:

od:

$PAM18; PA18;$

[[0.00564844833254520, 0.0111328191498919, 0.0201361776569166, 0.0334230554075498, 0.0509112381874338, 0.0711673076826027, 0.0912951184498982, 0.107476941523388,

0.116113882188486, 0.115120926585945, 0.104743159916656, 0.0874577117623363,
0.0670148687903280, 0.0471242266689881, 0.0304100048035884, 0.0180088889447834,
0.00978710687525741, 0.00488109585823993, 0.00223395474826060,
0.000938261063375356, 0.000361629118087348],
[0.000110242842916382, 0.000416603605773819, 0.00137451057945856,
0.00395945603943091, 0.00995850985462634, 0.0218691856493611,
0.0419331281673903, 0.0702059903248139, 0.102633239241318, 0.131009369536009,
0.146022370684465, 0.142115078950718, 0.120771483531935, 0.0896170416887110,
0.0580652109584672, 0.0328500952540569, 0.0162273389822779, 0.00699909229884732,
0.00263580007749242, 0.000866664711275611, 0.000248798792775617],
[$6.24520799352849 \times 10^{-7}$, $4.93742613854645 \times 10^{-6}$, 0.0000323908504886411,
0.000176338416941091, 0.000796722955280451, 0.00298768097303431,
0.00929941487713924, 0.0240268299595985, 0.0515321510228085, 0.0917526749169538,
0.135622434190326, 0.166427874927243, 0.169553710536360, 0.143408759629362,
0.100699460566248, 0.0587020371326155, 0.0284080180405931, 0.0114123083696718,
0.00380566096890822, 0.00105338335374927, 0.000241999870858156],
[$3.21369419584182 \times 10^{-8}$, $3.23857659622509 \times 10^{-7}$, $2.70784924448310 \times 10^{-6}$,
0.0000187867684436322, 0.000108161390448948, 0.000516795327545868,
0.00204937978907322, 0.00674547802602003, 0.0184295753353912,
0.0417977402057587, 0.0786944384971100, 0.122999672701846, 0.159603806092293,
0.171936551278091, 0.153773206124018, 0.114176809455260, 0.0703805598130746,
0.0360158405664981, 0.0152997625170166, 0.00539518664166239, 0.00157919458146516
]]

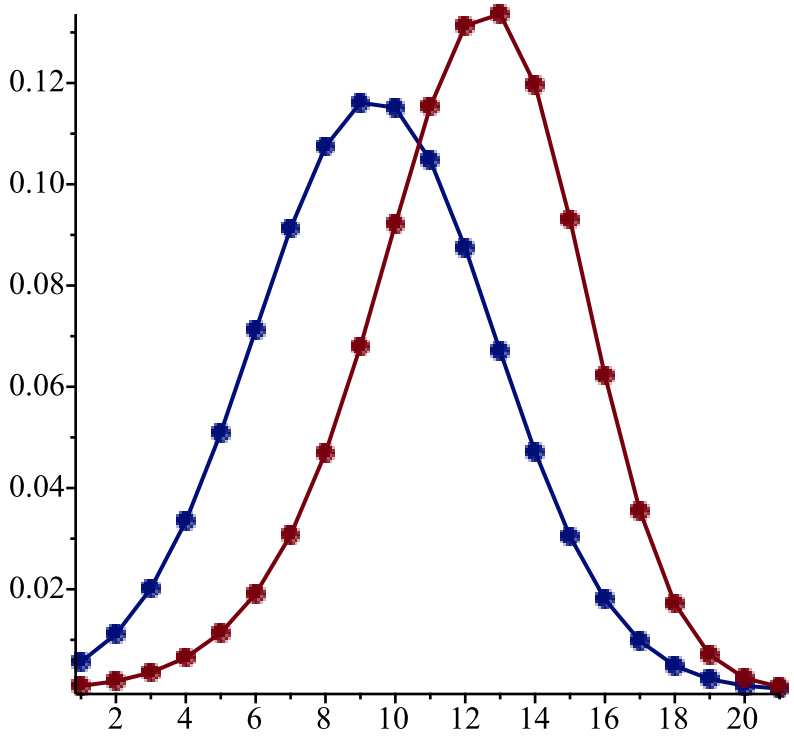
$$\begin{bmatrix} 0.000898004474608666 \\ 0.00183994439586878 \\ 0.00354848512770082 \\ 0.00649840037963117 \\ 0.0113775380135207 \\ 0.0190977404119253 \\ 0.0306849321315443 \\ 0.0469650123895131 \\ 0.0679799685561466 \\ 0.0921305746492580 \\ 0.115358523993168 \\ 0.131320635534092 \\ 0.133629557426564 \\ 0.119659228168838 \\ 0.0930574795236851 \\ 0.0622102080795515 \\ 0.0354805648736453 \\ 0.0171737171587488 \\ 0.00703259262474752 \\ 0.00243391806336881 \\ 0.000713145642446410 \end{bmatrix} \quad \textbf{(26)}$$

for *j* **from** *1* ***to*** *NM18* ***do***

dataplot([*PAM18*[*j*,..], *PA18*[..]], *caption* = *typeset*("Output P(A | M18=", *j*, "), P(A18)"));

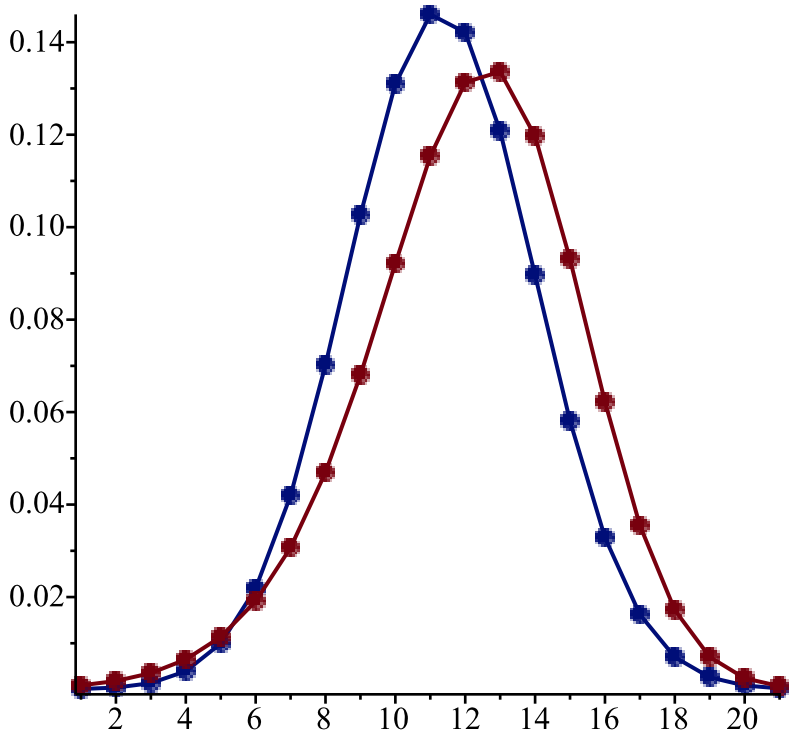
end do;

$$j := 1$$



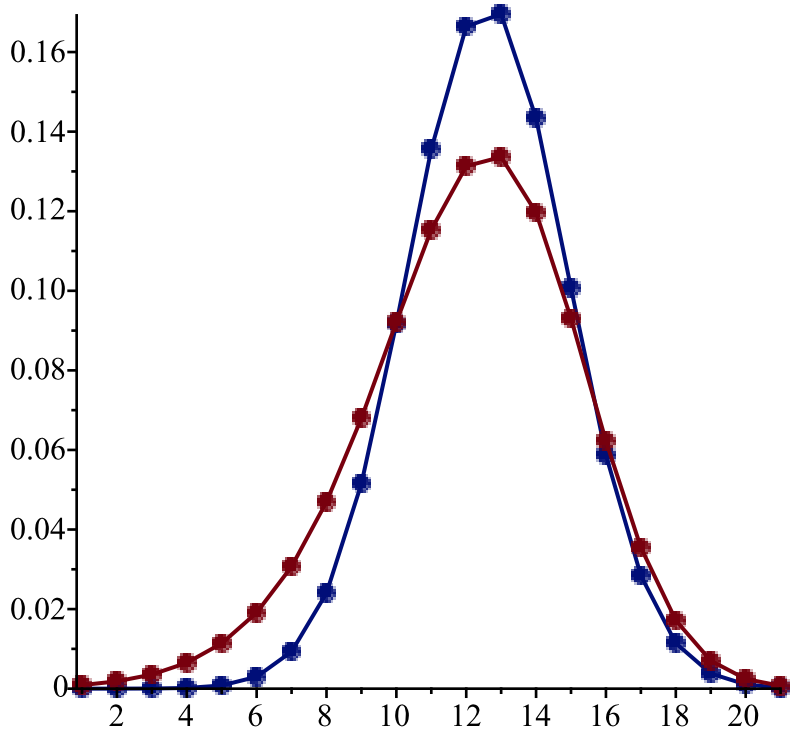
Output P(A | M18=1), P(A18)

$j := 2$



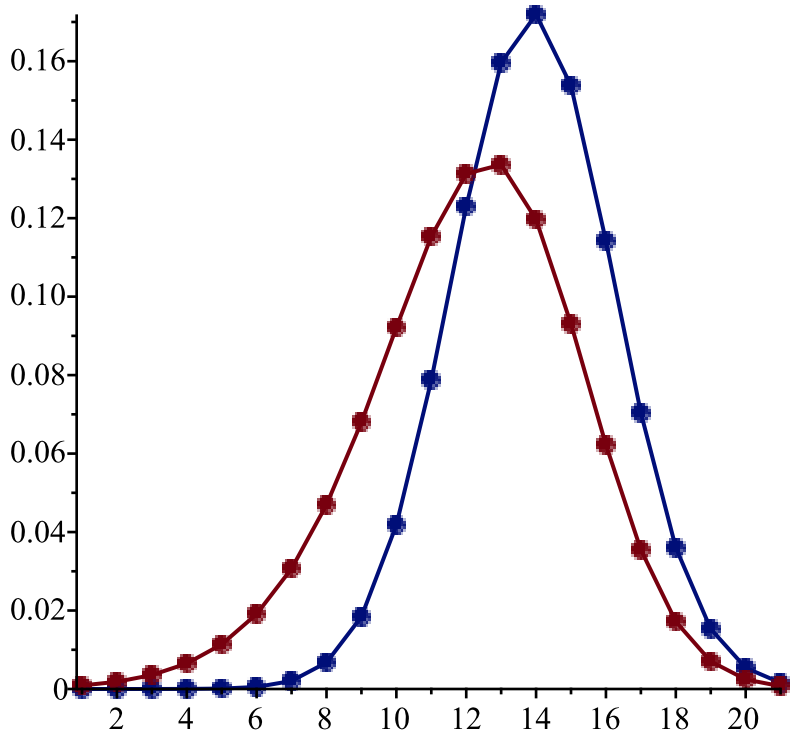
Output P(A | M18=2), P(A18)

$j := 3$



Output P(A | M18=3), P(A18)

$j := 4$



Output P(A | M18=4), P(A18)

$j := 5$

(27)

#NMenM18, $X[3,1], X[3,2], X[3,3], X[3,4]$, *PA18*;
E18, *S18*;

$$\begin{bmatrix} 18.9 \\ 20.8 \\ 22.1 \\ 23.4 \end{bmatrix}, \begin{bmatrix} 3.4 \\ 2.7 \\ 2.3 \\ 2.3 \end{bmatrix} \tag{28}$$

E48, *S48*;

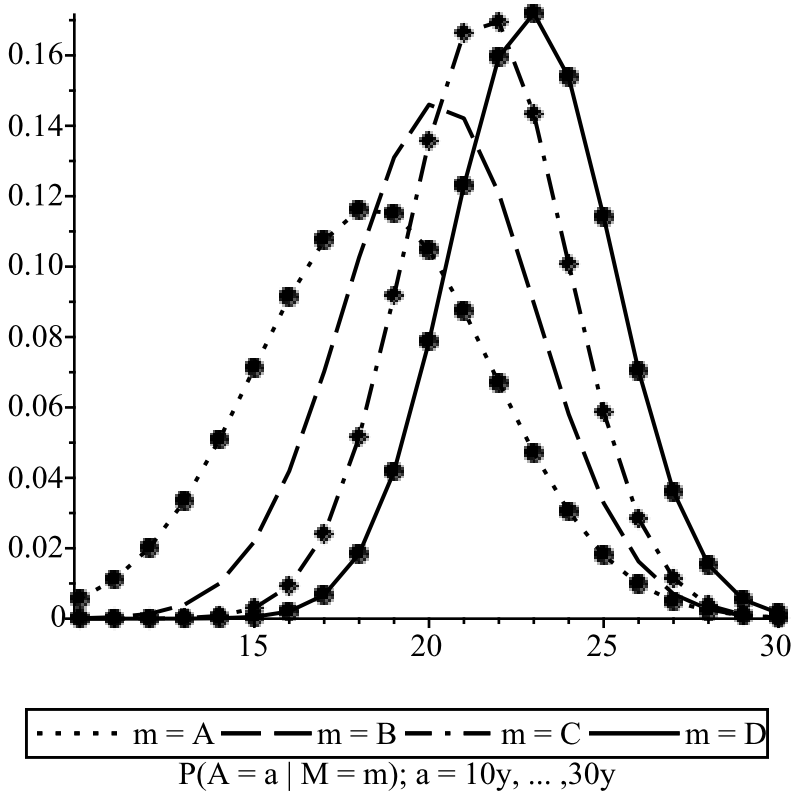
$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 4.0 \\ 2.9 \\ 1.9 \\ 2.2 \end{bmatrix} \tag{29}$$

Transpose(*PAM18*);

$$\begin{aligned}
&[[0.00564844833254520, 0.000110242842916382, 6.24520799352849 \times 10^{-7}, \\
&\quad 3.21369419584182 \times 10^{-8}], \\
&\quad [0.0111328191498919, 0.000416603605773819, 4.93742613854645 \times 10^{-6}, \\
&\quad 3.23857659622509 \times 10^{-7}], \\
&\quad [0.0201361776569166, 0.00137451057945856, 0.0000323908504886411, 2.70784924448310 \\
&\quad \times 10^{-6}], \\
&\quad [0.0334230554075498, 0.00395945603943091, 0.000176338416941091, \\
&\quad 0.0000187867684436322], \\
&\quad [0.0509112381874338, 0.00995850985462634, 0.000796722955280451, \\
&\quad 0.000108161390448948], \\
&\quad [0.0711673076826027, 0.0218691856493611, 0.00298768097303431, \\
&\quad 0.000516795327545868], \\
&\quad [0.0912951184498982, 0.0419331281673903, 0.00929941487713924, \\
&\quad 0.00204937978907322], \\
&\quad [0.107476941523388, 0.0702059903248139, 0.0240268299595985, 0.00674547802602003], \\
&\quad [0.116113882188486, 0.102633239241318, 0.0515321510228085, 0.0184295753353912], \\
&\quad [0.115120926585945, 0.131009369536009, 0.0917526749169538, 0.0417977402057587], \\
&\quad [0.104743159916656, 0.146022370684465, 0.135622434190326, 0.0786944384971100], \\
&\quad [0.0874577117623363, 0.142115078950718, 0.166427874927243, 0.122999672701846], \\
&\quad [0.0670148687903280, 0.120771483531935, 0.169553710536360, 0.159603806092293], \\
&\quad [0.0471242266689881, 0.0896170416887110, 0.143408759629362, 0.171936551278091],
\end{aligned} \tag{30}$$

[0.0304100048035884, 0.0580652109584672, 0.100699460566248, 0.153773206124018],
[0.0180088889447834, 0.0328500952540569, 0.0587020371326155, 0.114176809455260],
[0.00978710687525741, 0.0162273389822779, 0.0284080180405931, 0.0703805598130746],
[0.00488109585823993, 0.00699909229884732, 0.0114123083696718, 0.0360158405664981],
[0.00223395474826060, 0.00263580007749242, 0.00380566096890822, 0.0152997625170166],
[0.000938261063375356, 0.000866664711275611, 0.00105338335374927, 0.00539518664166239],
[0.000361629118087348, 0.000248798792775617, 0.000241999870858156, 0.00157919458146516]]

dataplot(10 ..30, [*PAM18*[1,..], *PAM18*[2,..], *PAM18*[3,..], *PAM18*[4,..],], *linestyle* = [*dot*, *dash*, *dashdot*, *solid*], *color* = "black", *caption* = *typeset*("P(A = a | M = m); a = 10y, ... ,30y "), *legend* = [*typeset*("m = A"), *typeset*("m = B"), *typeset*("m = C"), *typeset*("m = D")]);



for *i* **from** 1 **to** *NA* **do** *#Alter A*

for *j* **from** 1 **to** *NM18* **do** *# Merkmal M18*

$$PM18A[i,j] := \frac{PAM18[j,i] \cdot PM18[j]}{PA18[i]} :$$

od:

for j **from** 1 **to** $NM28$ **do** # *Merkmal M28*

$$PM28A[i,j] := \frac{PAM28[j,i] \cdot PM28[j]}{PA28[i]} :$$

od:
for j **from** 1 **to** $NM38$ **do** # *Merkmal M38*

$$PM38A[i,j] := \frac{PAM38[j,i] \cdot PM38[j]}{PA38[i]} :$$

od:
for j **from** 1 **to** $NM48$ **do** # *Merkmal M48*

$$PM48A[i,j] := \frac{PAM48[j,i] \cdot PM48[j]}{PA48[i]} :$$

od:
od:

$add(PA18[i], i = 1..NA);$

0.999090171618573 **(31)**

for i **from** 1 **to** NA **do** $SPAM18 := VectorAdd(SPAM18, PAM18[..,i])$ **end do**:
for i **from** 1 **to** NA **do** $SPAM28 := VectorAdd(SPAM28, PAM28[..,i])$ **end do**:
for i **from** 1 **to** NA **do** $SPAM38 := VectorAdd(SPAM38, PAM38[..,i])$ **end do**:
for i **from** 1 **to** NA **do** $SPAM48 := VectorAdd(SPAM48, PAM48[..,i])$ **end do**:
#SPAM18;SPAM28; SPAM38; SPAM48;
$\#Transpose(PAM18); Transpose(PAM28); Transpose(PAM38); Transpose(PAM48);$
#PMA18;PMA28;PMA38;PMA48;
for j **from** 1 **to** $NM18$ **do** $SPMA18 := VectorAdd(SPMA18, PM18A[..,j])$ **end do**:
for j **from** 1 **to** $NM28$ **do** $SPMA28 := VectorAdd(SPMA28, PM28A[..,j])$ **end do**:
for j **from** 1 **to** $NM38$ **do** $SPMA38 := VectorAdd(SPMA38, PM38A[..,j])$ **end do**:
for j **from** 1 **to** $NM48$ **do** $SPMA48 := VectorAdd(SPMA48, PM48A[..,j])$ **end do**:
#SPMA18;SPMA28; SPMA38; SPMA48;

##
##
##
##
 # Berechnung P(M|A) aus KREITNER 1997 Claviculae
##

```
#####################################################################
# ###################################################################
#####################################################################



# INPUT JOINT HISTOGRAM          P(A,M)·N
A := Matrix(21, 4, 0.) :

# ###################################################################
#Bestückung der Matrix A  ##########################################
# ################ Weglassen der Niveaus A  <= 9 J ############## Also: N =279  - 12 = 267
     ##############################################
# ###################################################################### M = m1
A[1, 1] := 1. :
A[2, 1] := 2. : A[3, 1] := 2. : A[4, 1] := 6. : A[5, 1] := 4. : A[6, 1] := 1. : A[7, 1] := 1. :
# ###################################################################### M = m2
A[4, 2] := 1. : A[5, 2] := 4. : A[6, 2] := 12. : A[7, 2] := 12. : A[8, 2] := 8. : A[9, 2] := 8. :
A[10, 2] := 4. : A[11, 2] := 1. : A[13, 2] := 1. :
# ###################################################################### M = m3
A[7, 3] := 1. : A[8, 3] := 4. : A[9, 3] := 6. : A[10, 3] := 14. : A[11, 3] := 18. : A[12, 3] := 14. :
A[13, 3] := 12. : A[14, 3] := 11. : A[15, 3] := 5. : A[16, 3] := 3. : A[17, 3] := 2. :
# ###################################################################### M = m4
A[13, 4] := 1. : A[14, 4] := 9. : A[15, 4] := 11. : A[16, 4] := 25. : A[17, 4] := 21. :
A[18, 4] := 12. : A[19, 4] := 19. : A[20, 4] := 10. : A[21, 4] := 1. :

A
```

$$\begin{bmatrix} 1. & 0. & 0. & 0. \\ 2. & 0. & 0. & 0. \\ 2. & 0. & 0. & 0. \\ 6. & 1. & 0. & 0. \\ 4. & 4. & 0. & 0. \\ 1. & 12. & 0. & 0. \\ 1. & 12. & 1. & 0. \\ 0. & 8. & 4. & 0. \\ 0. & 8. & 6. & 0. \\ 0. & 4. & 14. & 0. \\ 0. & 1. & 18. & 0. \\ 0. & 0. & 14. & 0. \\ 0. & 1. & 12. & 1. \\ 0. & 0. & 11. & 9. \\ 0. & 0. & 5. & 11. \\ 0. & 0. & 3. & 25. \\ 0. & 0. & 2. & 21. \\ 0. & 0. & 0. & 12. \\ 0. & 0. & 0. & 19. \\ 0. & 0. & 0. & 10. \\ 0. & 0. & 0. & 1. \end{bmatrix} \quad \textbf{(32)}$$

$interface(rtablesize = 100)$

$$100 \quad \textbf{(33)}$$

$eval(A)$:

#NA:=21;
NM2 := 4;

$$NM2 := 4 \quad \textbf{(34)}$$

Age axis
T := Vector(NA, 0.)

$$T := \begin{bmatrix} 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \\ 0. \end{bmatrix} \quad (35)$$

for i **from** 1 **to** NA **do** $T[i] := (convert(i, float) + AMin)$ **end do**:

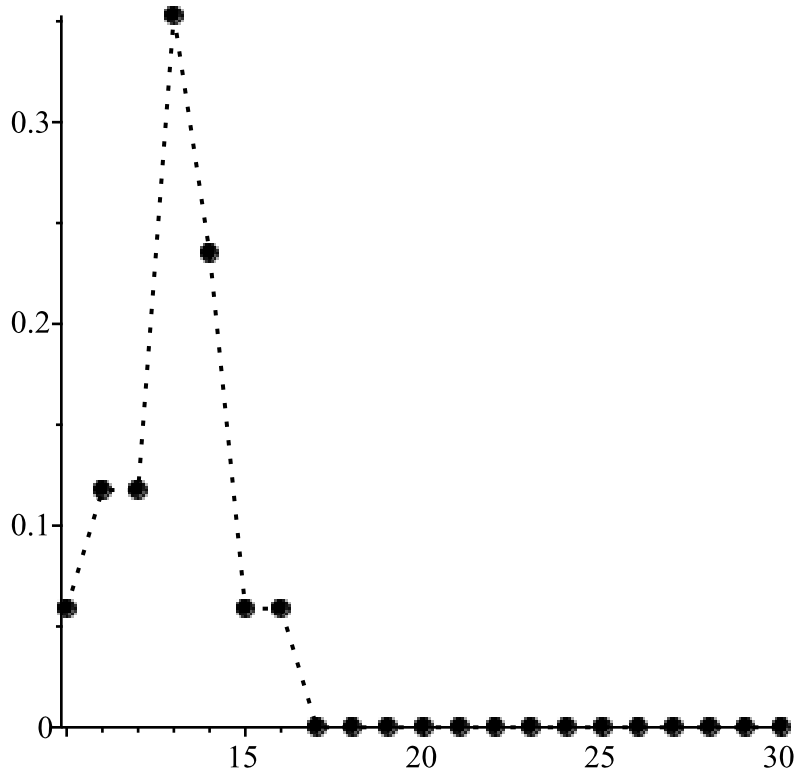
#AMin:=9;

#Berechnung der Randsummen
$SRows := Vector(NA, fill = 0.)$:
for i **from** 1 **to** $NM2$ **do** $SRows[..] := SRows[..] + Vector(A[.., i])$ **end do** :
#SRows;
$SCol := Vector(NM2, fill = 0.)$:
$AT := Transpose(A)$:
for i **from** 1 **to** NA **do** $SCol := SCol + AT[.., i]$ **end do** :
#SCol;

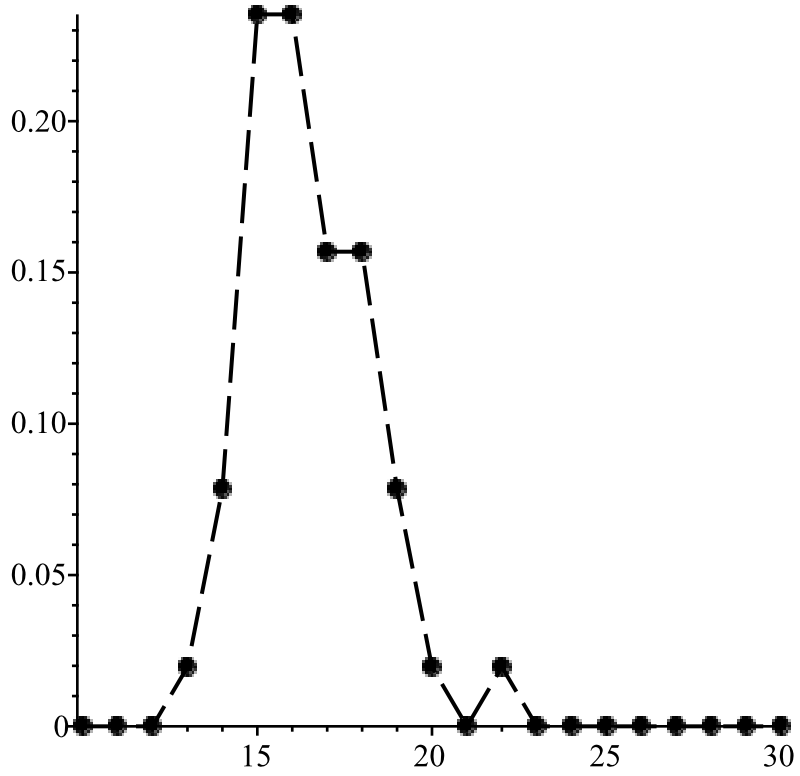
$N := add(SCol)$

$$N := 267. \quad (36)$$

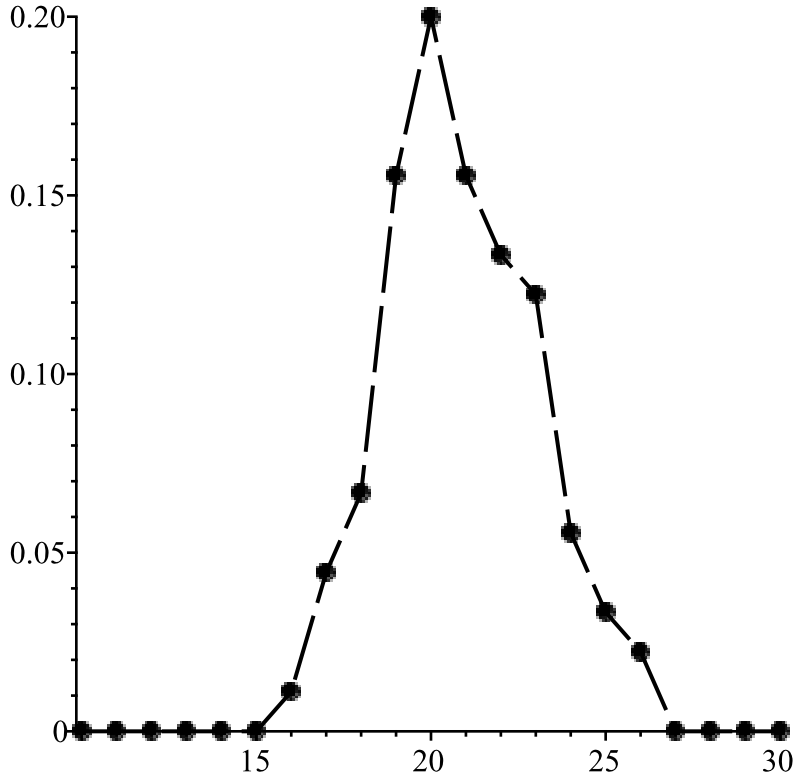
$$p1 := dataplot\left(T, \left(\frac{A[\,..,1\,]}{SCol(1)}\right), linestyle = dot, color = \text{"black"}\right);$$



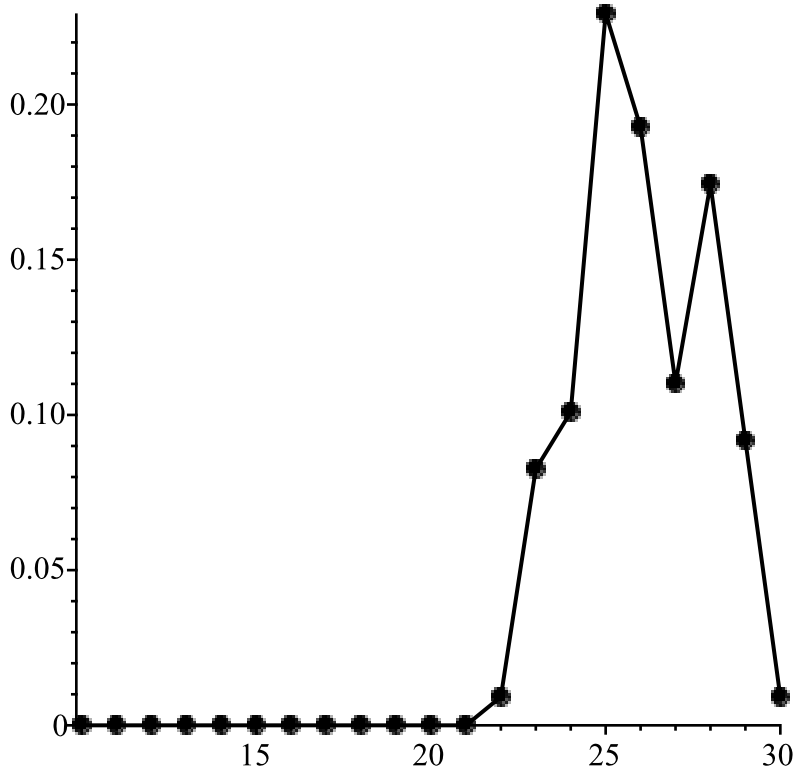
$$p2 := dataplot\left(T, \left(\frac{A[\,..,2\,]}{SCol(2)}\right), linestyle = dash, color = \text{"black"}\right);$$



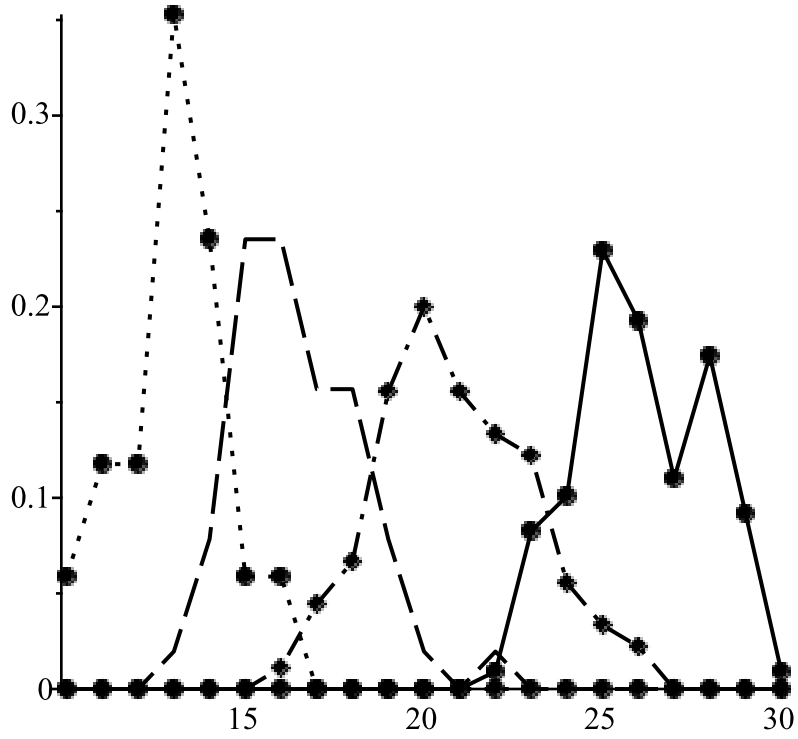
$$p3 := dataplot\left(T, \left(\frac{A[\,..,3\,]}{SCol(3)}\right), linestyle = longdash, color = \text{"black"}\right);$$



$$p4 := dataplot\left(T, \left(\frac{A[\,..,4\,]}{SCol(4)}\right), linestyle = solid, color = \text{"black"}\right);$$

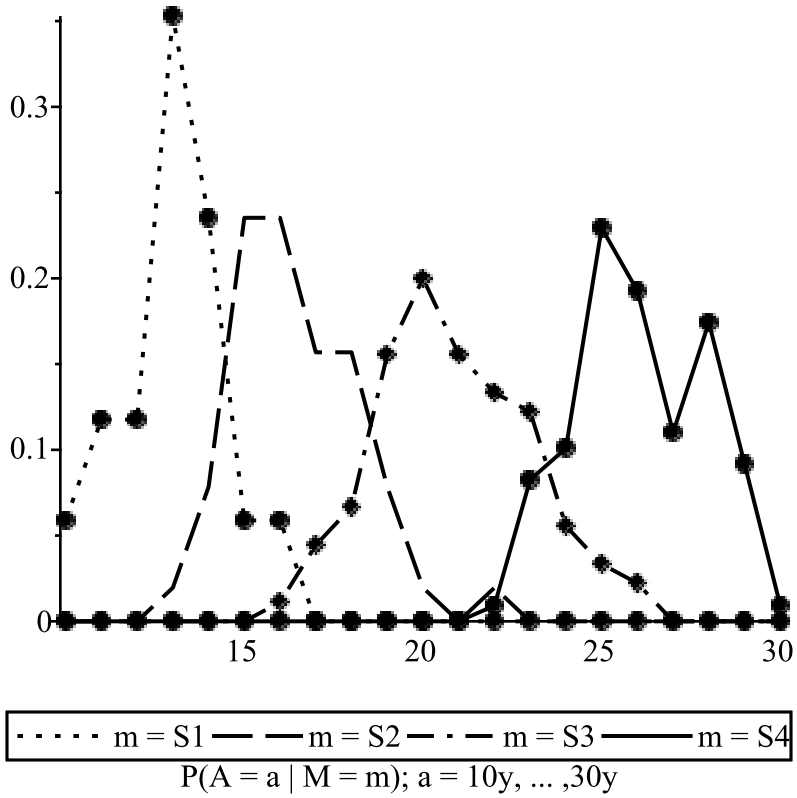


$$dataplot\left(10..30, \left[\left(\frac{A[..,1]}{SCol(1)}\right), \left(\frac{A[..,2]}{SCol(2)}\right), \left(\frac{A[..,3]}{SCol(3)}\right), \left(\frac{A[..,4]}{SCol(4)}\right)\right], linestyle = [dot, dash, dashdot, solid], color = \text{"black"}, caption = typeset(\text{"P[A = a | M = m]; a = 10y, ... ,30y; m = S1, S2, S3, S4"})\right);$$



P[A = a | M = m]; a = 10y, ... ,30y; m = S1, S2, S3, S4

$$dataplot\left(10..30, \left[\left(\frac{A[..,1]}{SCol(1)}\right), \left(\frac{A[..,2]}{SCol(2)}\right), \left(\frac{A[..,3]}{SCol(3)}\right), \left(\frac{A[..,4]}{SCol(4)}\right)\right], linestyle = [dot, dash, dashdot, solid], color = \text{"black"}, caption = typeset(\text{"P(A = a | M = m); a = 10y, ... ,30y "}), legend = [typeset(\text{"m = S1"}), typeset(\text{"m = S2"}), typeset(\text{"m = S3"}), typeset(\text{"m = S4"})]\right);$$



$PMA := Matrix(NA, NM2, 0.) : PAM := Matrix(NA, NM2, 0.) :$

for i **from** 1 **to** NA **do** $\left(PMA[i,..] := \frac{A[i,..]}{SRows[i]} \right)$ **end do** :

\# PAM

for k **from** 1 **to** $NM2$ **do** $\left(PAM[\,..,k] := \frac{A[\,..,k]}{SCol[k]} \right)$ **end do** :

PAM;

$$\begin{bmatrix}
0.0588235294117647 & 0. & 0. & 0. \\
0.117647058823529 & 0. & 0. & 0. \\
0.117647058823529 & 0. & 0. & 0. \\
0.352941176470588 & 0.0196078431372549 & 0. & 0. \\
0.235294117647059 & 0.0784313725490196 & 0. & 0. \\
0.0588235294117647 & 0.235294117647059 & 0. & 0. \\
0.0588235294117647 & 0.235294117647059 & 0.0111111111111111 & 0. \\
0. & 0.156862745098039 & 0.0444444444444444 & 0. \\
0. & 0.156862745098039 & 0.0666666666666667 & 0. \\
0. & 0.0784313725490196 & 0.155555555555556 & 0. \\
0. & 0.0196078431372549 & 0.200000000000000 & 0. \\
0. & 0. & 0.155555555555556 & 0. \\
0. & 0.0196078431372549 & 0.133333333333333 & 0.00917431192660551 \\
0. & 0. & 0.122222222222222 & 0.0825688073394495 \\
0. & 0. & 0.0555555555555556 & 0.100917431192661 \\
0. & 0. & 0.0333333333333333 & 0.229357798165138 \\
0. & 0. & 0.0222222222222222 & 0.192660550458716 \\
0. & 0. & 0. & 0.110091743119266 \\
0. & 0. & 0. & 0.174311926605505 \\
0. & 0. & 0. & 0.0917431192660551 \\
0. & 0. & 0. & 0.00917431192660551
\end{bmatrix} \quad \textbf{(37)}$$

 # Berechne kumulative bedingte Altersverteilung
$CAM := Matrix(NA, NM2, 0.)$:
for i **from** 1 **to** NA **do** ($CAM[i,..] := add(PAM[j,..], j = 1..i)$:) **end do**:
 # Altersvektor T
$T := Vector(NA, fill = 0.)$:

for i **from** 1 **to** NA **by** 1 **do** $T(i) := convert(i + AMin, float)$ **end do** :
#T;

#Ergebnisvektoren E, S
$E := Vector(NM2, 0.)$:
$S := Vector(NM2, 0.)$:

 # Hilfsfeld für EW, S
$Aux := Matrix(NA, NM2, 0.)$:

for i **from** 1 **to** NA **do**
for j **from** 1 **to** $NM2$ **do** ($Aux[i,j] := A[i,j] \cdot T[i]$:) **end do**:
end do:
 # Berechne Schätzer des bedingten EW von A unter der Bedingung einer festen Merkmalsausprägung
for j **from** 1 **to** $NM2$ **do** $\left(E[j] := \frac{add(Aux[i,j], i = 1..NA)}{add(A[i,j], i = 1..NA)} : \right)$ **end do**:
$Aux := Matrix(NA, NM2, 0.)$:
for i **from** 1 **to** NA **do**
for j **from** 1 **to** $NM2$ **do** ($Aux[i,j] := A[i,j] \cdot ((T[i] - E[j]))^{2.}$:) **end do**:
end do:
 # Berechne Schätzer des bedingten EW von A unter der Bedingung einer festen Merkmalsausprägung
for j **from** 1 **to** $NM2$ **do** $\left(S[j] := \sqrt{\frac{add(Aux[i,j], i = 1..NA)}{add(A[i,j], i = 1..NA) - 1.}} : \right)$ **end do**:

E;

$$\begin{bmatrix} 13.00000000 \\ 16.45098039 \\ 20.84444444 \\ 26.05504587 \end{bmatrix} \quad \textbf{(38)}$$

S;

$$\begin{bmatrix} 1.500000000 \\ 1.758564477 \\ 2.156313496 \\ 1.824904170 \end{bmatrix} \quad \textbf{(39)}$$

##\
##
 # Berechnung PAM rekonstruiert
$PAMR := Matrix(NA, NM2, 0.)$:
for i **from** 2 **to** NA **do** ($PAMR[i, 1] := CDF(Normal(E(1), S(1)), T(i)) - CDF(Normal(E(1), S(1)), T(i-1))$) **end do**:
$PAMR[1, 1] := CDF(Normal(E(1), S(1)), T(1)) - CDF(Normal(E(1), S(1)), T(1) - 1.)$

$$PAMR_{1,1} := 0.0189197513805895 \quad \textbf{(40)}$$

for i **from** 2 **to** NA **do** ($PAMR[i,2] := CDF(Normal(E(2),S(2)),T(i)) - CDF(Normal(E(2),S(2)),T(i-1))$) **end do**:
$PAMR[1,2] := CDF(Normal(E(2),S(2)),T(1)) - CDF(Normal(E(2),S(2)),T(1)-1.)$

$$PAMR_{1,2} := 0.000110745940469459 \quad \textbf{(41)}$$

for i **from** 2 **to** NA **do** ($PAMR[i,3] := CDF(Normal(E(3),S(3)),T(i)) - CDF(Normal(E(3),S(3)),T(i-1))$) **end do**:
$PAMR[1,3] := CDF(Normal(E(3),S(3)),T(1)) - CDF(Normal(E(3),S(3)),T(1)-1.)$

$$PAMR_{1,3} := 2.26549502642103 \times 10^{-7} \quad \textbf{(42)}$$

for i **from** 2 **to** NA **do** ($PAMR[i,4] := CDF(Normal(E(4),S(4)),T(i)) - CDF(Normal(E(4),S(4)),T(i-1))$) **end do**:
$PAMR[1,4] := CDF(Normal(E(4),S(4)),T(1)) - CDF(Normal(E(4),S(4)),T(1)-1.)$

$$PAMR_{1,4} := 6.93385961580379 \times 10^{-19} \quad \textbf{(43)}$$

$PAMR$;

$$\begin{bmatrix} [0.0189197513805895, 0.000110745940469459, 2.26549502642103 \times 10^{-7}, 6.93385961580379 \times 10^{-19}], \\ [0.0684610877776887, 0.000846587771745780, 2.24633721723908 \times 10^{-6}, 7.86496286666355 \times 10^{-17}], \\ [0.161281317821055, 0.00471773570275084, 0.0000180180189160761, 6.62882110696384 \times 10^{-15}], \\ [0.247507462453077, 0.0191724468644406, 0.000116926461977463, 4.15253699931496 \times 10^{-13}], \\ [0.247507462453077, 0.0568393306037088, 0.000613964565554107, 1.93399903093889 \times 10^{-11}], \\ [0.161281317821055, 0.122961036322860, 0.00260883373905027, 6.69884984102871 \times 10^{-10}], \\ [0.0684610877776887, 0.194143242550816, 0.00897151941678053, 1.72618769641762 \times 10^{-8}], \\ [0.0189197513805894, 0.223752368501610, 0.0249713070160220, 3.31030097034565 \times 10^{-7}], \\ [0.00340132023439299, 0.188243838265781, 0.0562608029522376, 4.72595900193029 \times 10^{-6}], \\ [0.000397389091363665, 0.115600784248295, 0.102609492485784, 0.0000502467084272176], \\ [0.0000301406150965411, 0.0518119266071710, 0.151498040428796, \end{bmatrix} \quad \textbf{(44)}$$

$0.000397988470292000\,]$,
$[\,1.48241370290236 \times 10^{-6},\ 0.0169447589970415,\ 0.181083190125853,$
$0.00234921538119809\,]$,
$[\,4.72264459761007 \times 10^{-8},\ 0.00404254937383941,\ 0.175229521704889,$
$0.0103371127891571\,]$,
$[\,9.73503722079272 \times 10^{-10},\ 0.000703302563508146,\ 0.137275569760301,$
$0.0339172462348912\,]$,
$[\,1.29717347974179 \times 10^{-11},\ 0.0000891927401124315,\ 0.0870617465222639,$
$0.0830022444189520\,]$,
$[\,1.11577413974828 \times 10^{-13},\ 8.24209356586891 \times 10^{-6},\ 0.0446985670123755,$
$0.151526454516017\,]$,
$[\,6.66133814775094 \times 10^{-16},\ 5.54726649837356 \times 10^{-7},\ 0.0185767141282634,$
$0.206382664049904\,]$,
$[\,0.,\ 2.71809245111498 \times 10^{-8},\ 0.00624918980373557,\ 0.209736428143082\,]$,
$[\,0.,\ 9.69181734866709 \times 10^{-10},\ 0.00170146325019693,\ 0.159034734200703\,]$,
$[\,0.,\ 2.51373366566554 \times 10^{-11},\ 0.000374908033637156,\ 0.0899706515551915\,]$,
$[\,0.,\ 4.74065231514942 \times 10^{-13},\ 0.0000668474757897775,\ 0.0379705270177421\,]\,]$

 # Rekonstruktion der Tafel A aus Tab 1
$AR := Matrix(NA, NM2, 0.)$:
for i **from** 1 **to** NA **do** $(AR(i,1) := PAMR(i,1) \cdot SCol(1))$ **end do**:
for i **from** 1 **to** NA **do** $(AR(i,2) := PAMR(i,2) \cdot SCol(2))$ **end do**:
for i **from** 1 **to** NA **do** $(AR(i,3) := PAMR(i,3) \cdot SCol(3))$ **end do**:
for i **from** 1 **to** NA **do** $(AR(i,4) := PAMR(i,4) \cdot SCol(4))$ **end do**:

 # Graphische Darstellung

 # Balkendiagramm
for i **from** 1 **to** NA **do** $(dataplot(\{A[i,..], AR[i,..]\}, bar))$ **end do**:

 # Balkendiagramm
for i **from** 1 **to** $NM2$ **do** $(dataplot(\{A[\,..,i], AR[\,..,i]\}, bar))$ **end do**:

 # Berechnung rekonstruierte bedingte Wahrscheinlichkeit $P(M \mid A)$ aus $P(A \mid M)$
$PMAR := Matrix(NA, NM2, 0.)$:

for i **from** 1 **to** NA **do** $\left(PMAR[i,1] := \frac{AR[i,1]}{SRows(i)} \right)$ **end do**:

for i **from** 1 **to** NA **do** $\left(PMAR[i,2] := \frac{AR[i,2]}{SRows(i)} \right)$ **end do**:

for i **from** 1 **to** NA **do** $\left(PMAR[i,3] := \frac{AR[i,3]}{SRows(i)} \right)$ **end do**:

for i **from** 1 **to** NA **do** $\left(PMAR[i,4] := \frac{AR[i,4]}{SRows(i)} \right)$ **end do**:

$PMAR$;

$$\begin{bmatrix} [0.321635773470021, 0.00564804296394241, 0.0000203894552377893, 7.55790698122613 \times 10^{-17}], \\ [0.581919246110354, 0.0215879881795174, 0.000101085174775759, 4.28640476233163 \times 10^{-15}], \\ [1.37089120147897, 0.120302260420146, 0.00810810851223423, 3.61270750329529 \times 10^{-13}], \\ [0.601089551671759, 0.139684970012353, 0.00150334022542453, 6.46609332750472 \times 10^{-12}], \\ [0.525953357712789, 0.362350732598644, 0.00690710136248370, 2.63507367965423 \times 10^{-10}], \\ [0.210906338689072, 0.482385604035835, 0.0180611566549634, 5.61672794363177 \times 10^{-9}], \\ [0.0831313208729077, 0.707236097863686, 0.0576740533935892, 1.34396042078229 \times 10^{-7}], \\ [0.0268029811225017, 0.950947566131843, 0.187284802620165, 3.00685671473063 \times 10^{-6}], \\ [0.00413017457033435, 0.685745410825344, 0.361676590407241, 0.0000367949665150287], \\ [0.000375311919621239, 0.327535555370169, 0.513047462428922, 0.000304271734364818], \\ [0.0000269679187705894, 0.139074118787670, 0.717622296767982, 0.00228319701378042], \\ [1.80007378209573 \times 10^{-6}, 0.0617273363463655, 1.16410622223762, 0.0182903197536137], \\ [5.73463986852651 \times 10^{-8}, 0.0147264298618436, 1.12647549667429, 0.0804818067155802], \\ [8.27478163767381 \times 10^{-10}, 0.00179342153694577, 0.617740063921355, \end{bmatrix} \quad \textbf{(45)}$$

```
    0.184848991980157 ],
    [ 1.37824682222565 × 10^-11, 0.000284301859108375, 0.489722324187735,
    0.565452790104111 ],
    [ 6.77434299132886 × 10^-14, 0.0000150123847092612, 0.143673965396921,
    0.589870840794493 ],
    [ 4.92359776138113 × 10^-16, 1.23004604963935 × 10^-6, 0.0726914900671179,
    0.978074364410417 ],
    [ 0., 1.15518929172387 × 10^-7, 0.0468689235280167, 1.90510588896633 ],
    [ 0., 2.60148781464222 × 10^-9, 0.00805956276409073, 0.912357159361925 ],
    [ 0., 1.28200416948943 × 10^-10, 0.00337417230273440, 0.980680101951587 ],
    [ 0., 2.41773268072620 × 10^-11, 0.00601627282107997, 4.13878744493389 ]]
#
    ##############################################################################
    ##########################################################
```

```
# ######################################################################
##########################################################
# ######################################################################
##########################################################
# Berechnung     P(A|M1&M2)     aus OLZE 2012 3rd molar  M1    und     KREITNER 1997
    Claviculae
 M2
```

$$M2 \tag{46}$$

```
# ######################################################################
##########################################################
# ######################################################################
##########################################################

  # NA:=21;# AMin:=9;
NM2 := 4;
```

$$NM2 := 4 \tag{47}$$

```
NRows := NA :
NCols := NM18 :
PAM118 := Matrix(NRows, NCols, 0.) :

NRows := NA :
NCols := NM18·NM2
```

$$NCols := 16 \tag{48}$$

```
#PAM118:=Matrix(NRows, NCols, 0.)

PAM118M2 := Matrix(NRows, NCols, .0) :
```

Konstanten für Prior P(A) mit Dichte f

$a0 := 18.$

$$a0 := 18. \tag{49}$$

$aL := 10.$

$$aL := 10. \tag{50}$$

$aU := 30.$

$$aU := 30. \tag{51}$$

$z := 0.5$

$$z := 0.5 \tag{52}$$

A priori age distribution P(A)

#Prior f0 lower

$$f0 := x \to \begin{cases} \frac{1.}{a0 - aL} & x < a0 \text{ and } x \geq aL \\ 0 & x \geq a0 \text{ or } x < aL \end{cases}$$

$$f0 := x \mapsto \begin{cases} \frac{1.}{a0 - aL} & aL \leq x < a0 \\ 0 & a0 \leq x \text{ or } x < aL \end{cases} \tag{53}$$

#Prior f1 higher

$$f1 := x \to \begin{cases} \frac{1.}{aU - a0} & x \geq a0 \text{ and } x \leq aU \\ 0 & x < a0 \text{ or } x > aU \end{cases}$$

$$f1 := x \mapsto \begin{cases} \frac{1.}{aU - a0} & a0 \leq x \leq aU \\ 0 & x < a0 \text{ or } aU < x \end{cases} \tag{54}$$

#Prior P(A) Dichte f

$f := x \to z \cdot f0(x) + (1. - z) \cdot f1(x)$

$$f := x \mapsto z \cdot f0(x) + (1. - z) \cdot f1(x) \tag{55}$$

Fill Matrix PAM118M2 using BAYES-Theorem

Build age vector

Age **:=** ***Vector***$(NA + 1, 0.)$:

Build age vector for graphics

AgeGraph **:=** ***Vector***$(NA, 0.)$:

for nx **from** 1 **to** $NA + 1$ **do** $Age(nx) := convert(nx + AMin, float)$ **end do**:

for nx **from** 1 **to** NA **do** $AgeGraph(nx) := convert(nx + AMin, float)$ **end do**:

for *nx* **from** 1 **to** *NA* **do**
for *ny1* **from** *1* **to** *NM18* **do**
for *ny2* **from** 1 **to** *NM2* **do**
Nenner := 0. :
for *nxb* **from** *1* **to** *NA* **do**

$$Nenner := Nenner + PMA[nxb, ny2] \cdot PM18A[nxb, ny1] \cdot \int_{Age(nxb)}^{Age(nxb+1)} f(x)\, dx \quad :$$

end do:

$$PAM118M2[nx, NM2 \cdot (ny1 - 1) + ny2] := \frac{\left(PMA[nx, ny2] \cdot PM18A[nx, ny1] \cdot \int_{Age(nx)}^{Age(nx+1)} f(x)\, dx \right)}{Nenner} :$$

end do;
end do:
end do:

PAM118M2;

[[0.249997423419490, 0., 0., 0., 0.0652262529032548, 0., 0., 0., 0.00665759017448497, 0., 0., 0., 0.00237656507951668, 0., 0., 0.], **(56)**
[0.240483524548093, 0., 0., 0., 0.120300893364359, 0., 0., 0., 0.0256888441847405, 0., 0., 0., 0.0116888864088800, 0., 0., 0.],
[0.225537580789764, 0., 0., 0., 0.205804858972756, 0., 0., 0., 0.0873832138244554, 0., 0., 0., 0.0506763300898452, 0., 0., 0.],
[0.175217615779217, 0.0645691749864672, 0., 0., 0.277480709823070, 0.0188285528791450, 0., 0., 0.222660066118416, 0.00293205812832911, 0., 0., 0.164559322625105, 0.000950635461502835, 0., 0.],
[0.0889242562286055, 0.196616048064523, 0., 0., 0.232523361699260, 0.0946677355881637, 0., 0., 0.335179686718473, 0.0264825123433955, 0., 0., 0.315658606157908, 0.0109410853164202, 0., 0.],
[0.0113930517772168, 0.302287395250917, 0., 0., 0.0468012874013218, 0.228651703735011, 0., 0., 0.115201340976952, 0.109224552272834, 0., 0., 0.138234645787863, 0.0574964353416756, 0., 0.],
[0.00844654745761288, 0.224108946378263, 0.0579946254051866, 0., 0.0518626358359782, 0.253379355623237, 0.0228557384156342, 0., 0.207229258002478,

0.196477946621132, 0.00538982231657125, 0., 0.316805643850882, 0.131770115326251,
0.00148139094861305, 0.],
[0., 0.134070488869141, 0.208167533840413, 0., 0., 0.215573013156485,
0.116672813838102, 0., 0., 0.257965078675667, 0.0424592977029604, 0., 0.,
0.220400951660781, 0.0148667992305054, 0.],
[0., 0.0571817539622176, 0.133176787860478, 0., 0., 0.124412406690894,
0.101002059713709, 0., 0., 0.218422889302598, 0.0539263833479949, 0., 0.,
0.237723160069630, 0.0240528622941424, 0.],
[0., 0.0162678559326317, 0.176810544606180, 0., 0., 0.0455701781352950,
0.172645016303699, 0., 0., 0.111594123485017, 0.128573436943220, 0., 0.,
0.154707612216152, 0.0730489090469921, 0.],
[0., 0.00279972074331909, 0.156493758095472, 0., 0., 0.00960750826529482,
0.187192544407025, 0., 0., 0.0312009004763713, 0.184876417514335, 0., 0.,
0.0550954740367217, 0.133789624837322, 0.],
[0., 0., 0.121162233148699, 0., 0., 0., 0.168930132924745, 0., 0., 0.,
0.210365182004278, 0., 0., 0., 0.193901050253876, 0.],
[0., 0.00209861581252078, 0.0782031031925028, 0.0185084132772691, 0.,
0.00930954592647504, 0.120924700496728, 0.0225873566188548, 0.,
0.0456999386946557, 0.180525579230019, 0.0197629111703324, 0., 0.130914530570865,
0.211935205653568, 0.00722547529960384],
[0., 0., 0.0394060463083730, 0.0915670315555241, 0., 0., 0.0642994169328226,
0.117920277739679, 0., 0., 0.109414011290593, 0.117602399251043, 0., 0.,
0.163603987746016, 0.0547631310337393],
[0., 0., 0.0185787871749585, 0.116082429337647, 0., 0., 0.0304378998303094,
0.150095958541325, 0., 0., 0.0561315001020321, 0.162226854359278, 0., 0.,
0.106902678570771, 0.0962178900520295],
[0., 0., 0.00564274759234631, 0.133547519465280, 0., 0., 0.00883157459666614,
0.164963753560270, 0., 0., 0.0167816829029241, 0.183716296556840, 0., 0.,
0.0407088331133599, 0.138788016473810],
[0., 0., 0.00436383277538970, 0.130131922711617, 0., 0., 0.00620810254055995,
0.146109957723185, 0., 0., 0.0115566866450722, 0.159410180779221, 0., 0.,
0.0357086583048348, 0.153393653964935],
[0., 0., 0., 0.146852590908143, 0., 0., 0., 0.142596540069292, 0., 0., 0.,
0.144905002273857, 0., 0., 0., 0.177616370712209],
[0., 0., 0., 0.164129820019951, 0., 0., 0., 0.131138006942198, 0., 0., 0.,
0.118001851382288, 0., 0., 0., 0.184256565402224],
[0., 0., 0., 0.199180272724569, 0., 0., 0., 0.124588148805196, 0., 0., 0.,
0.0943745042271404, 0., 0., 0., 0.187738897061450],

[0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0., 0.]]

PAM;

$$\begin{bmatrix}
0.0588235294117647 & 0. & 0. & 0. \\
0.117647058823529 & 0. & 0. & 0. \\
0.117647058823529 & 0. & 0. & 0. \\
0.352941176470588 & 0.0196078431372549 & 0. & 0. \\
0.235294117647059 & 0.0784313725490196 & 0. & 0. \\
0.0588235294117647 & 0.235294117647059 & 0. & 0. \\
0.0588235294117647 & 0.235294117647059 & 0.0111111111111111 & 0. \\
0. & 0.156862745098039 & 0.0444444444444444 & 0. \\
0. & 0.156862745098039 & 0.0666666666666667 & 0. \\
0. & 0.0784313725490196 & 0.155555555555556 & 0. \\
0. & 0.0196078431372549 & 0.200000000000000 & 0. \\
0. & 0. & 0.155555555555556 & 0. \\
0. & 0.0196078431372549 & 0.133333333333333 & 0.00917431192660551 \\
0. & 0. & 0.122222222222222 & 0.0825688073394495 \\
0. & 0. & 0.0555555555555556 & 0.100917431192661 \\
0. & 0. & 0.0333333333333333 & 0.229357798165138 \\
0. & 0. & 0.0222222222222222 & 0.192660550458716 \\
0. & 0. & 0. & 0.110091743119266 \\
0. & 0. & 0. & 0.174311926605505 \\
0. & 0. & 0. & 0.0917431192660551 \\
0. & 0. & 0. & 0.00917431192660551
\end{bmatrix} \quad \textbf{(57)}$$

PM18A;

[[0.957173944502116, 0.0427006075755592, 0.000113389238334873, 0.0000120586839894115], [0.920747744640655, 0.0787554245398690, 0.000437521445368377, 0.0000593093741078935], [0.863523683105182, 0.134730911695534, 0.00148827365444958, 0.000257131544834793], [0.782672169865799, 0.211929401143168, 0.00442429323778030, 0.000974135753252700], [0.680934866704034, 0.304444556543718, 0.0114172751359749, 0.00320330161627252], [0.567072724528923, 0.398302265410621, 0.0255067818175006, 0.00911822824295642], [0.452754314487718, 0.475328927683661, 0.0494121655939684, 0.0225045922346526], **(58)**

[0.348241934085769, 0.519950355726778, 0.0834114105335639, 0.0483962996538892],
[0.259922212109426, 0.525132899582885, 0.123594954888809, 0.0913499334188798],
[0.190147537160836, 0.494607534355741, 0.162374709142333, 0.152870219341090],
[0.138170773626112, 0.440282937502296, 0.191683740745619, 0.229862548125974],
[0.101345703718025, 0.376417092516212, 0.206631497813384, 0.315605705952379],
[0.0763148139483294, 0.314357641730448, 0.206875090039206, 0.402452454282017],
[0.0599291678465495, 0.260499298015845, 0.195403759045380, 0.484167775092226],
[0.0497285059620921, 0.217033549821997, 0.176432785389121, 0.556805158826790],
[0.0440519841374863, 0.183669536600564, 0.153849096681343, 0.618429382580607],
[0.0419762863263599, 0.159081227729292, 0.130543075890764, 0.668399410053584],
[0.0432507097683317, 0.141755384949944, 0.108345935525996, 0.706647969755728],
[0.0483391621905514, 0.130364443952333, 0.0882303632116926, 0.733066030645424],
[0.0586621462645900, 0.123853222423906, 0.0705641198705281, 0.746920511440976],
[0.0771658896565804, 0.121347878176189, 0.0553274090794568, 0.746158823087774]]

$add(PAM118M2[i, 1], i = 1..NA); PAM;$

1.00000000000000

0.0588235294117647	0.	0.	0.
0.117647058823529	0.	0.	0.
0.117647058823529	0.	0.	0.
0.352941176470588	0.0196078431372549	0.	0.
0.235294117647059	0.0784313725490196	0.	0.
0.0588235294117647	0.235294117647059	0.	0.
0.0588235294117647	0.235294117647059	0.0111111111111111	0.
0.	0.156862745098039	0.0444444444444444	0.
0.	0.156862745098039	0.0666666666666667	0.
0.	0.0784313725490196	0.155555555555556	0.
0.	0.0196078431372549	0.200000000000000	0.
0.	0.	0.155555555555556	0.
0.	0.0196078431372549	0.133333333333333	0.00917431192660551
0.	0.	0.122222222222222	0.0825688073394495
0.	0.	0.0555555555555556	0.100917431192661
0.	0.	0.0333333333333333	0.229357798165138
0.	0.	0.0222222222222222	0.192660550458716
0.	0.	0.	0.110091743119266
0.	0.	0.	0.174311926605505
0.	0.	0.	0.0917431192660551
0.	0.	0.	0.00917431192660551

(59)

for *ny1* **from** *1* ***to*** *NM18* ***do***
for *ny2* **from** 1 **to** *NM2* **do**

$$add(PAM118M2[i, NM2\cdot(ny1-1)+ny2], i=1..NA);$$

end do;
end do;

$$ny1 := 1$$

$$ny2 := 1$$

1.00000000000000

$$ny2 := 2$$

1.00000000000000

$$ny2 := 3$$

1.00000000000000

$ny2 := 4$

1.

$ny2 := 5$

$ny1 := 2$

$ny2 := 1$

1.00000000000000

$ny2 := 2$

1.

$ny2 := 3$

1.00000000000000

$ny2 := 4$

1.

$ny2 := 5$

$ny1 := 3$

$ny2 := 1$

1.

$ny2 := 2$

1.

$ny2 := 3$

1.

$ny2 := 4$

1.00000000000000

$ny2 := 5$

$ny1 := 4$

$ny2 := 1$

1.

$ny2 := 2$

1.

$ny2 := 3$

1.00000000000000

$ny2 := 4$

1.

$ny2 := 5$

$ny1 := 5$ **(60)**

```
for ny1 from 1 to NM18 do
    for ny2 from 1 to NM2 do


          #dataplot(AgeGraph, [PAM[ .., ny2], PAM18[ny1,..], PAM118M2[ .., NM2·(ny1 − 1) + ny2]], caption = typeset("Output P(A | M18=", ny1, ", M2=", ny2, ")") );

          #dataplot(AgeGraph, [PMA[ .., ny2], PM18A[ .., ny1], PAM118M2[ .., NM2·(ny1 − 1) + ny2]], caption = typeset("Output P( M2=", ny2, " | A );  P(M18=", ny1, ",  | A );  P(A | M18=", ny1, ", M2=", ny2, ")") );
          # dataplot(AgeGraph, [PMA[ .., ny2], PM18A[ .., ny1], PAM118M2[ .., NM2·(ny1 − 1) + ny2]], linestyle = [dot, dash, dashdot, solid], color = "black", legend = [typeset("P( M2=", ny2, " | A )"), typeset("P(M1=", ny1, ",  | A );"), typeset("P(A | M18=", ny1, ", M2=", ny2, ")") ]);

    end do;
end do;
```

ny1 := 1

ny2 := 1

ny2 := 2

ny2 := 3

ny2 := 4

ny2 := 5

ny1 := 2

ny2 := 1

ny2 := 2

ny2 := 3

ny2 := 4

ny2 := 5

ny1 := 3

ny2 := 1

ny2 := 2

ny2 := 3

ny2 := 4

ny2 := 5

ny1 := 4

ny2 := 1

ny2 := 2

ny2 := 3

$$ny2 := 4$$

$$ny2 := 5$$

$$ny1 := 5 \quad \textbf{(61)}$$

$M18Lab := Array(["A", "B", "C", "D"], datatype = string);$

$$M18Lab := \left[\text{"A"} \quad \text{"B"} \quad \text{"C"} \quad \text{"D"} \right] \quad \textbf{(62)}$$

$M18Lab[3];$

$$\text{"C"} \quad \textbf{(63)}$$

$M2Lab := Array(["S1", "S2", "S3", "S4"], datatype = string);$

$$M2Lab := \left[\text{"S1"} \quad \text{"S2"} \quad \text{"S3"} \quad \text{"S4"} \right] \quad \textbf{(64)}$$

$M2Lab[3];$

$$\text{"S3"} \quad \textbf{(65)}$$

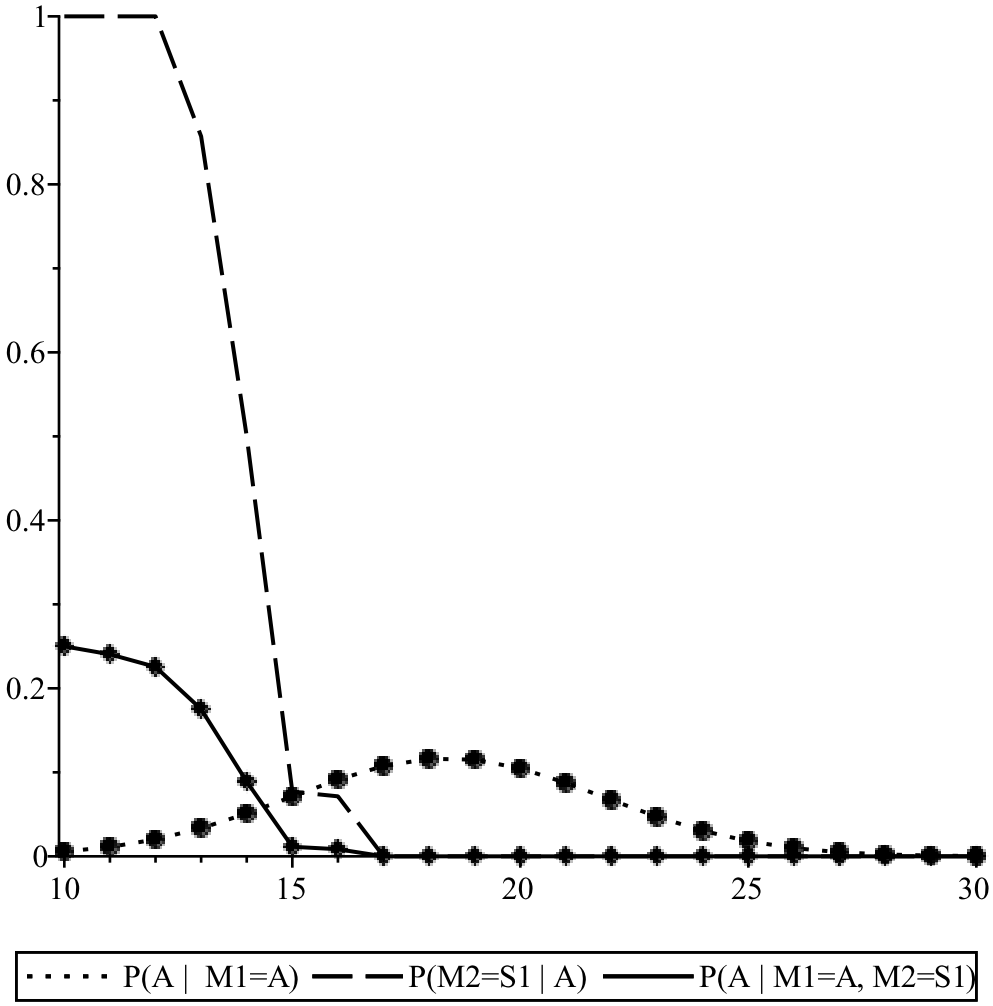
for *ny1* **from** *1* ***to*** *NM18* ***do***
for *ny2* **from** 1 **to** *NM2* **do**

dataplot(*AgeGraph*, [*PAM18*[*ny1*,..], *PMA*[.., *ny2*], *PAM118M2*[.., *NM2* · (*ny1* − 1) + *ny2*]], *linestyle* = [*dot*, *dash*, *solid*], *color* = "black", *legend* = [*typeset*("P(A | M1=", *M18Lab*[*ny1*], ") "), *typeset*("P(M2=", *M2Lab*[*ny2*], " | A) "), *typeset*("P(A | M1=", *M18Lab*[*ny1*], ", M2=", *M2Lab*[*ny2*], ")")]);

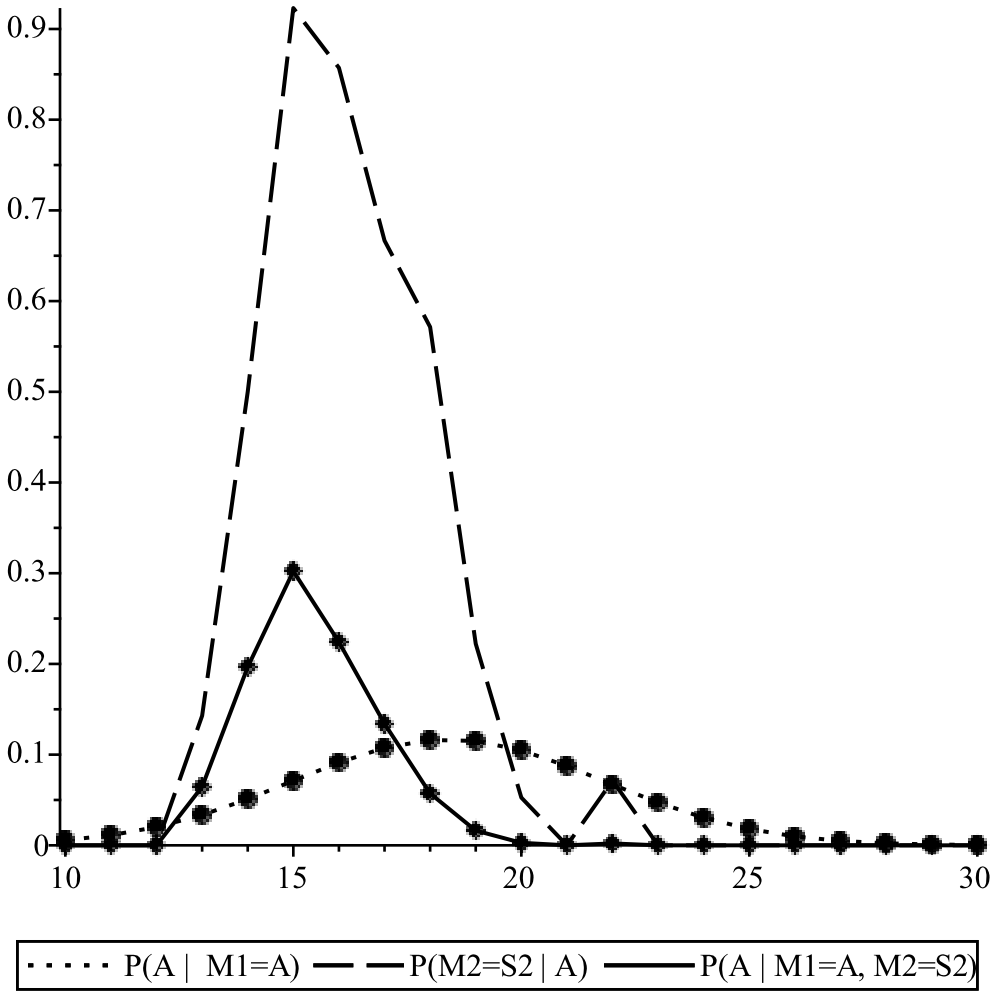
end do;
end do;

$$ny1 := 1$$

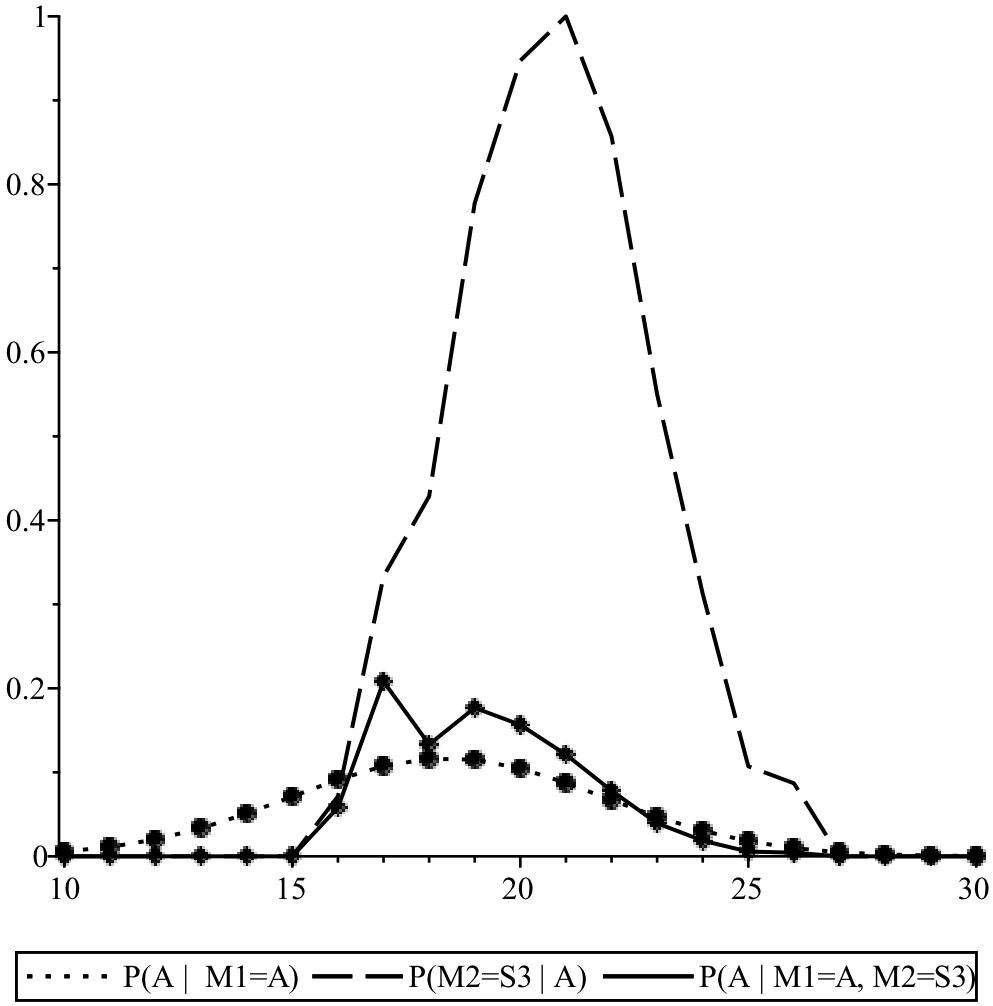
$$ny2 := 1$$



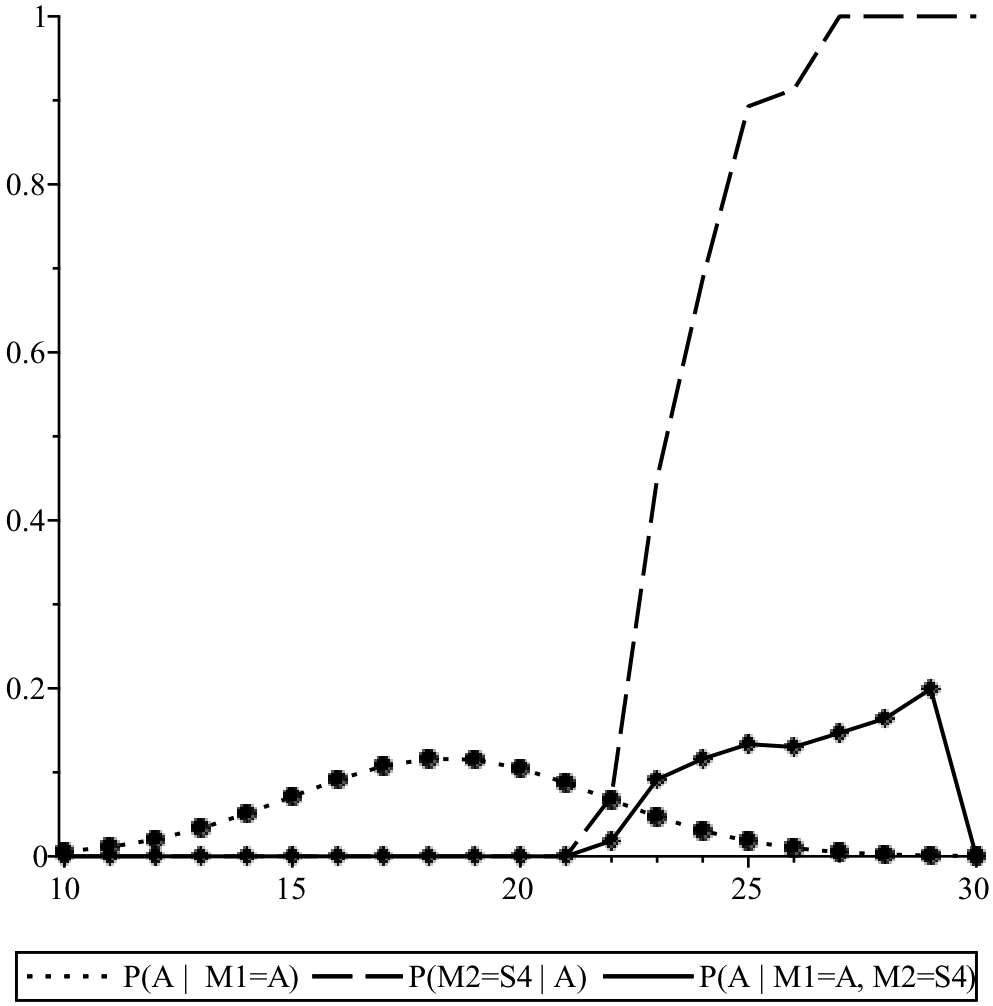
$ny2 := 2$



$ny2 := 3$



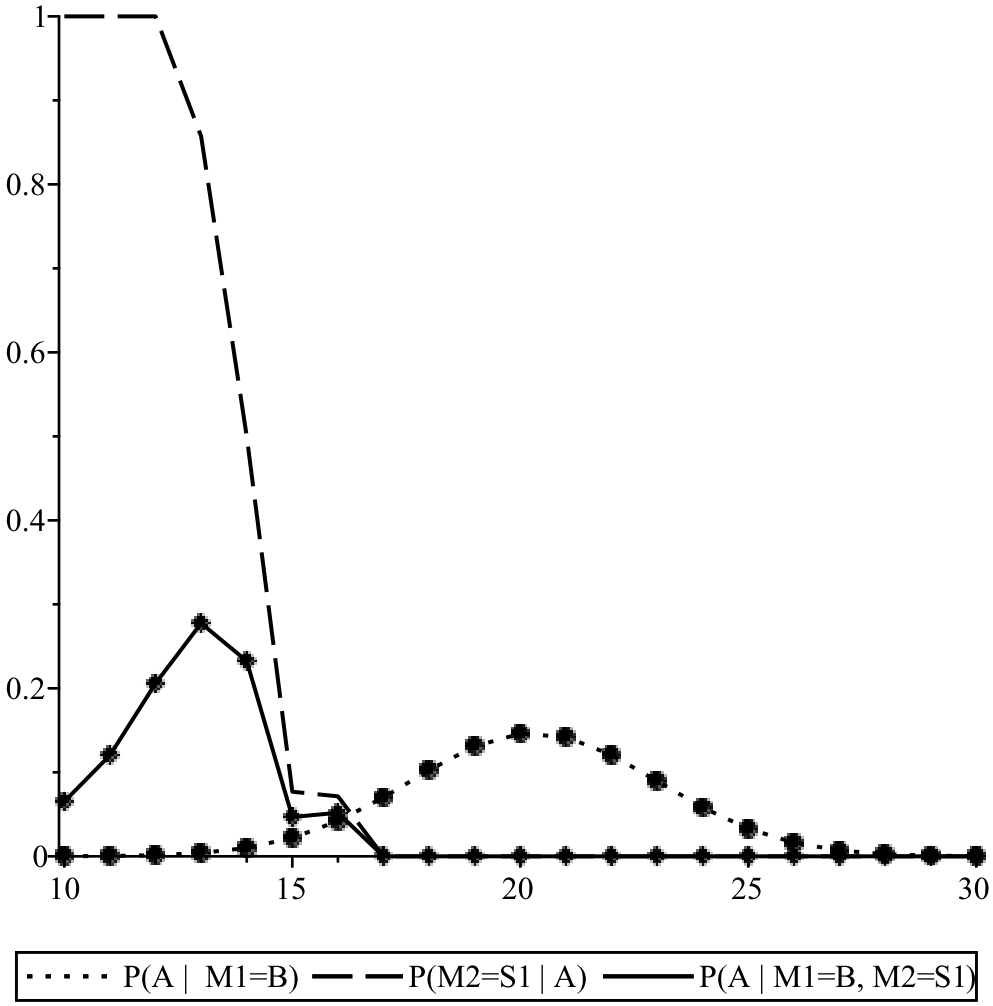
$ny2 := 4$



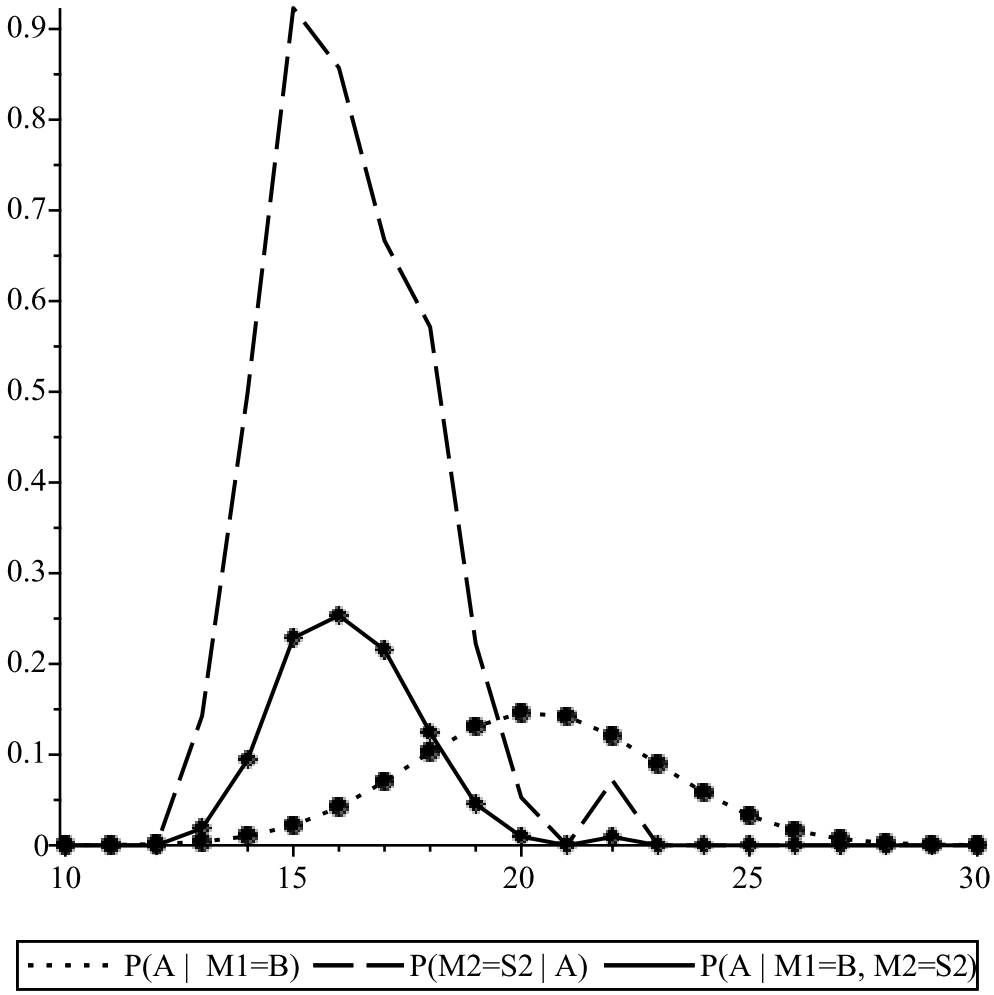
$ny2 := 5$

$ny1 := 2$

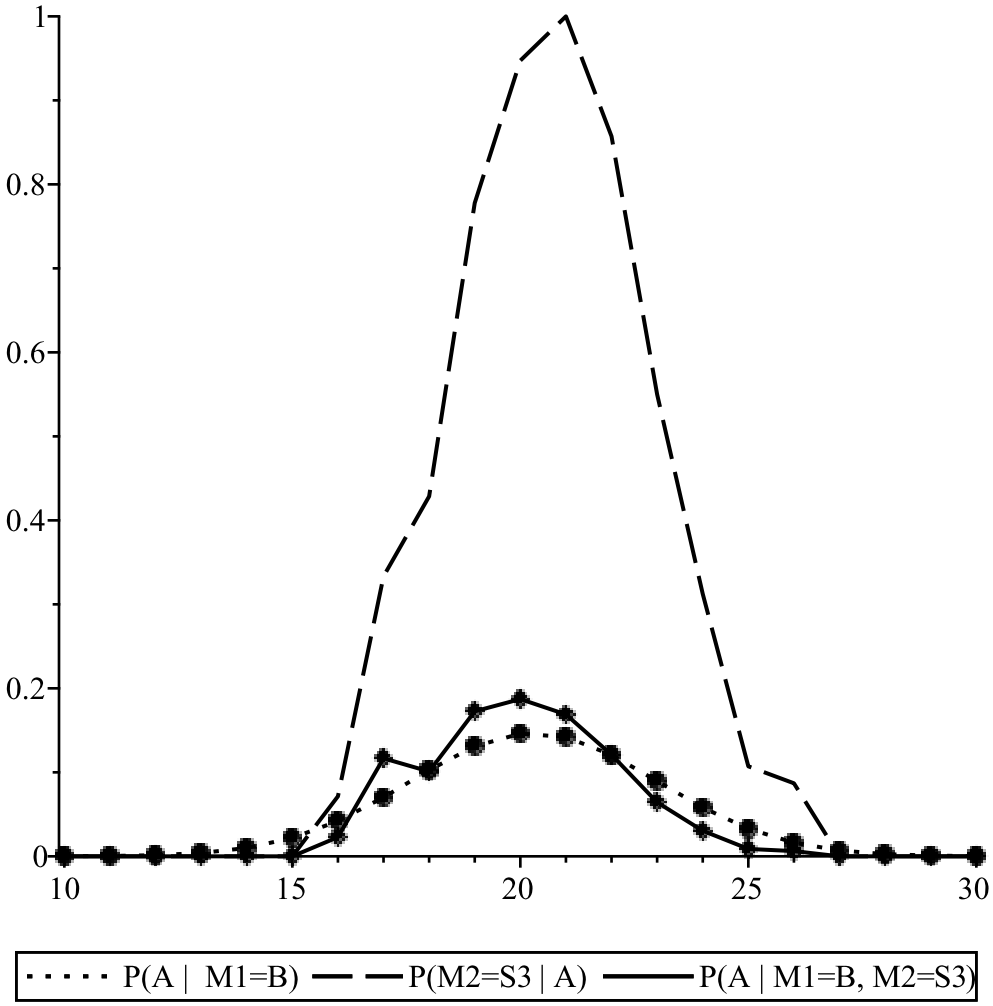
$ny2 := 1$



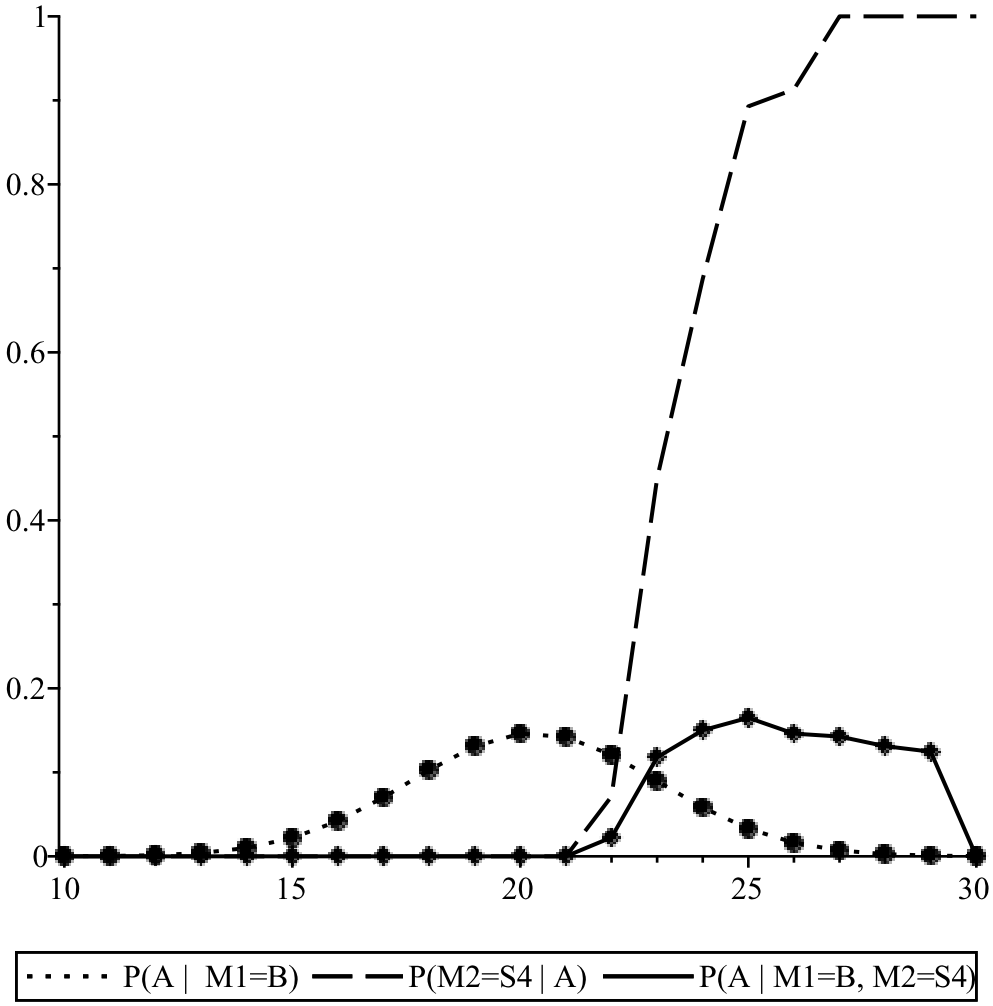
$ny2 := 2$



ny2 := 3



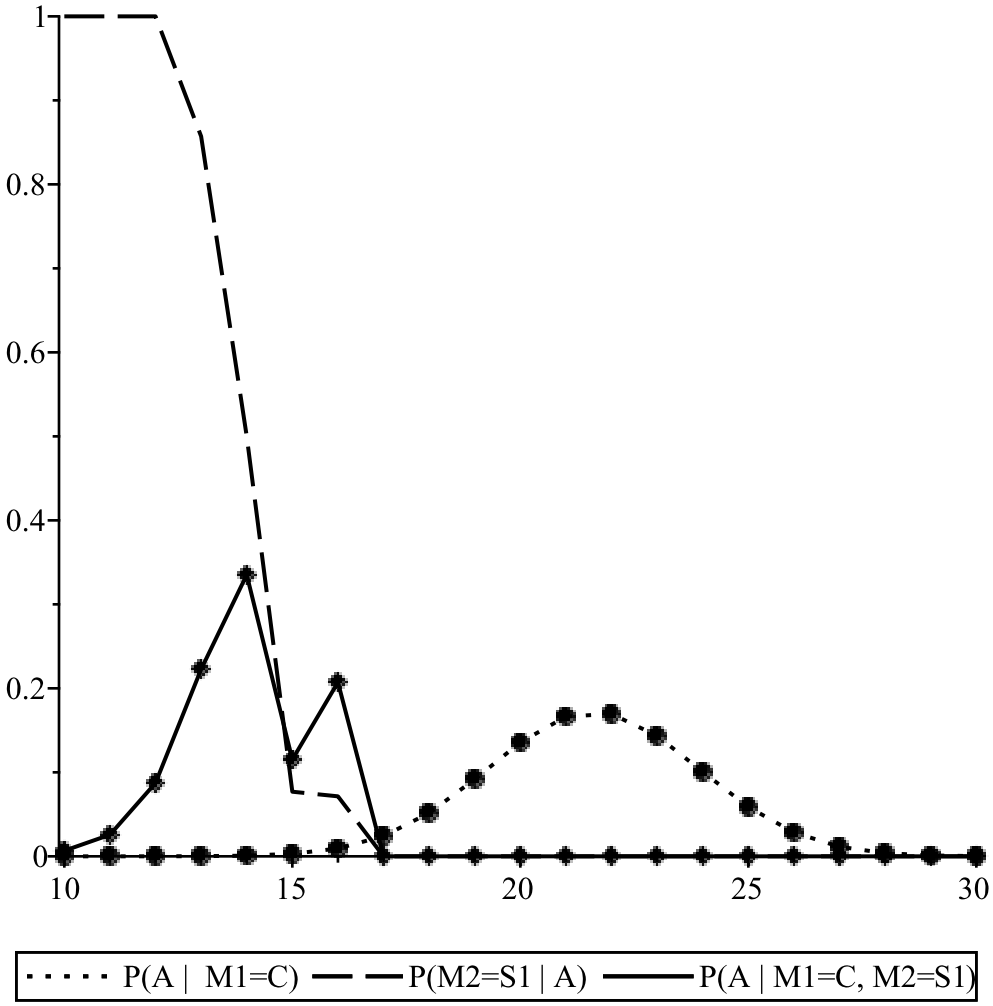
$ny2 := 4$



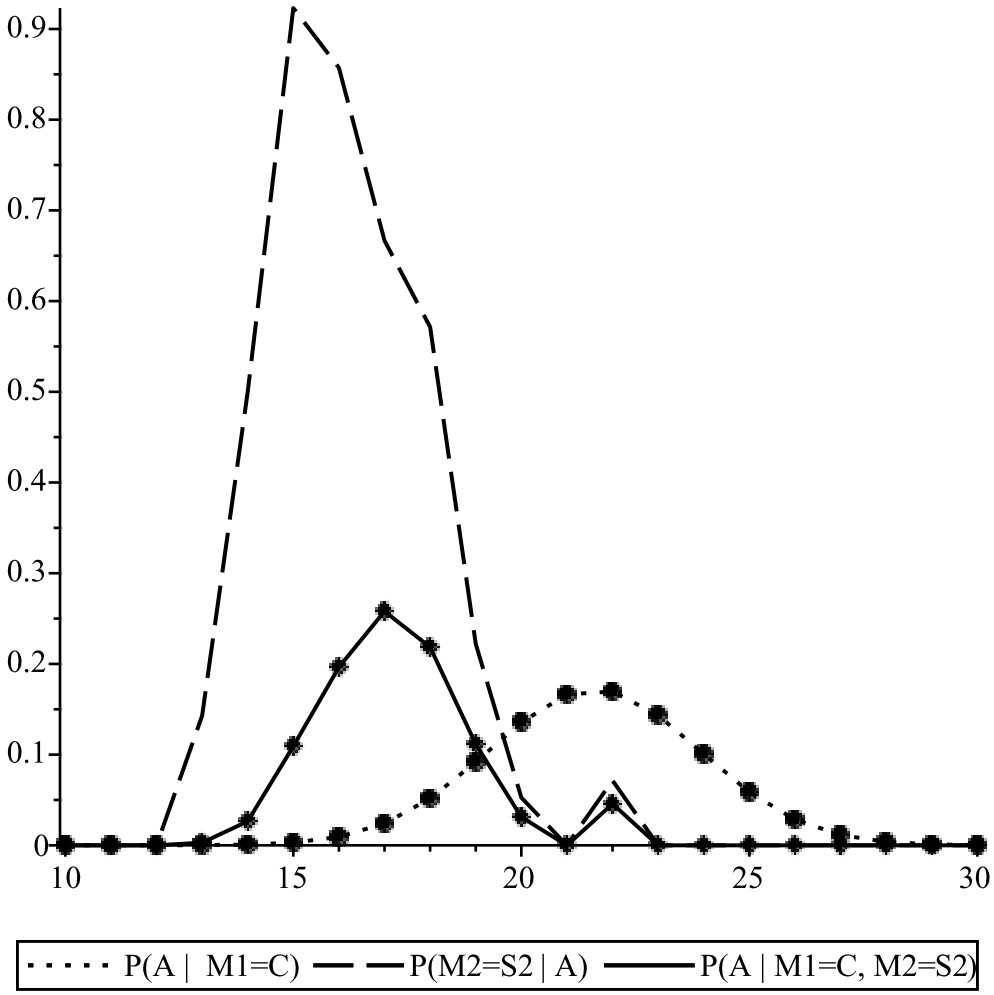
$ny2 := 5$

$ny1 := 3$

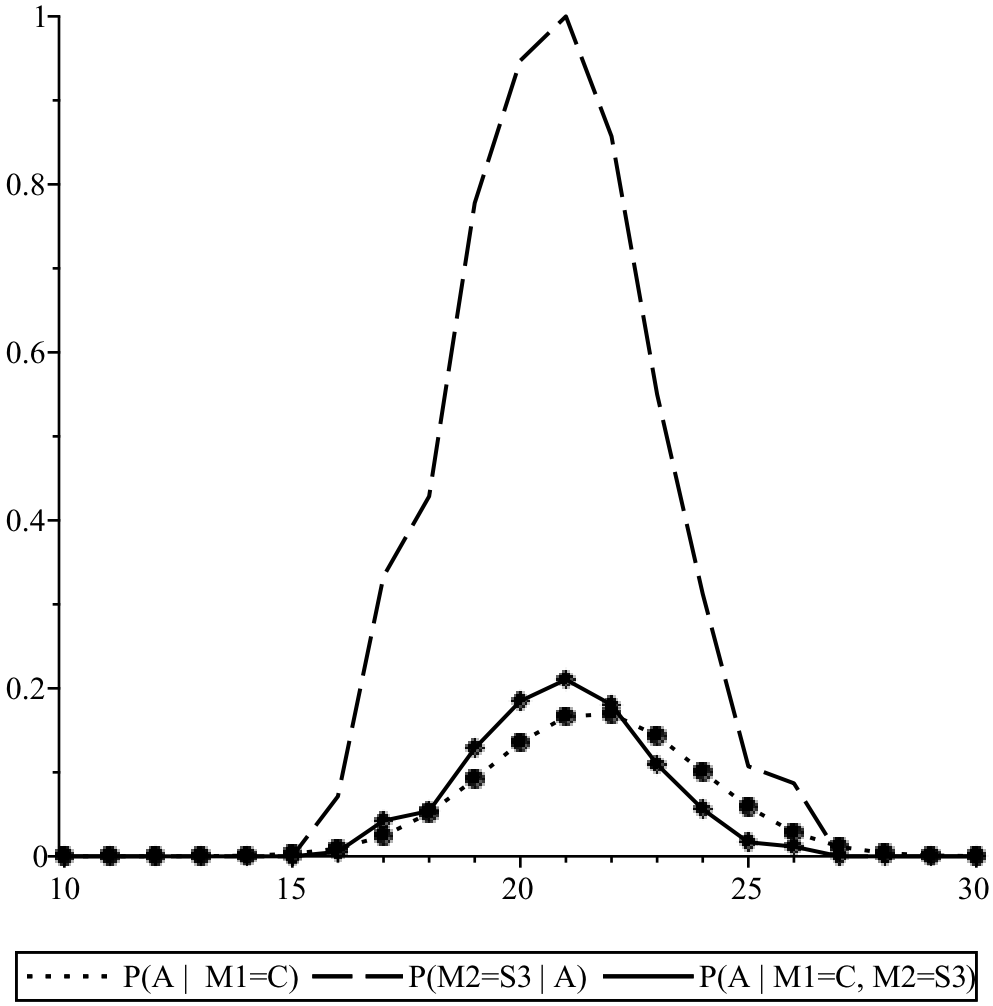
$ny2 := 1$



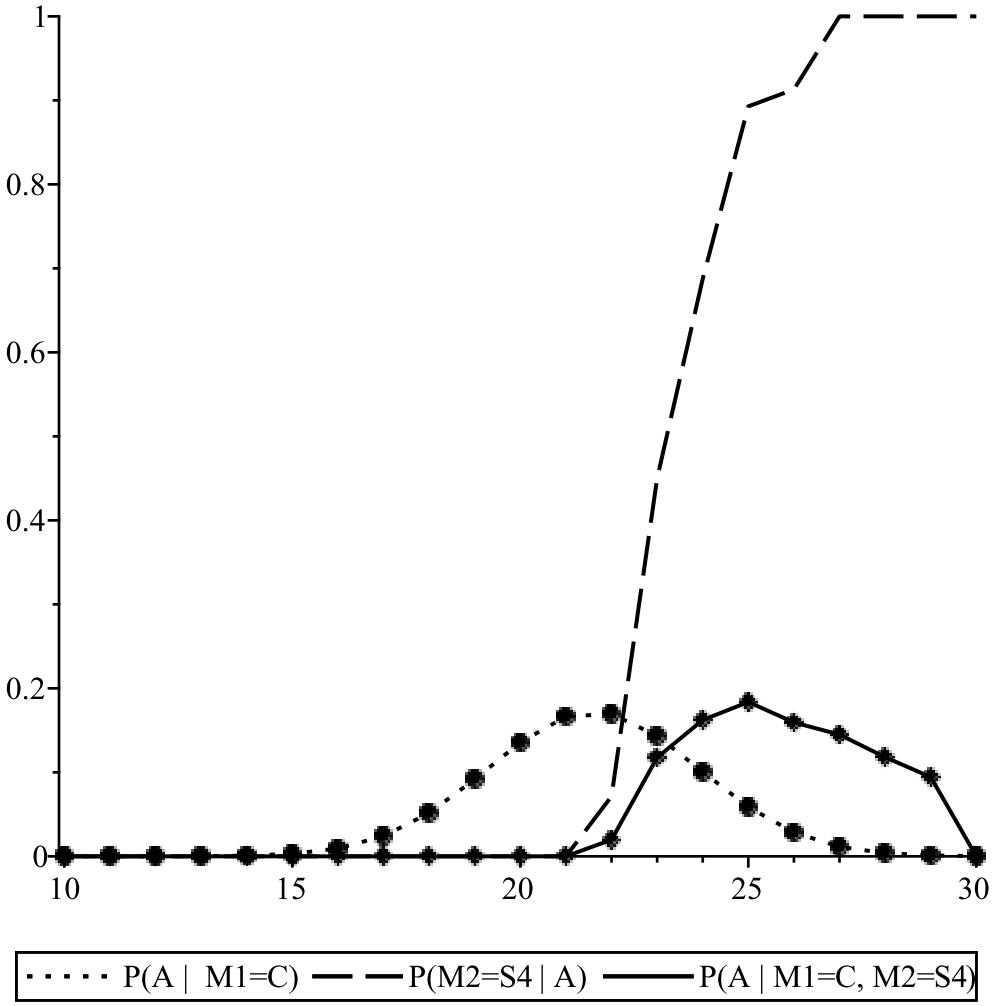
$ny2 := 2$



ny2 := 3



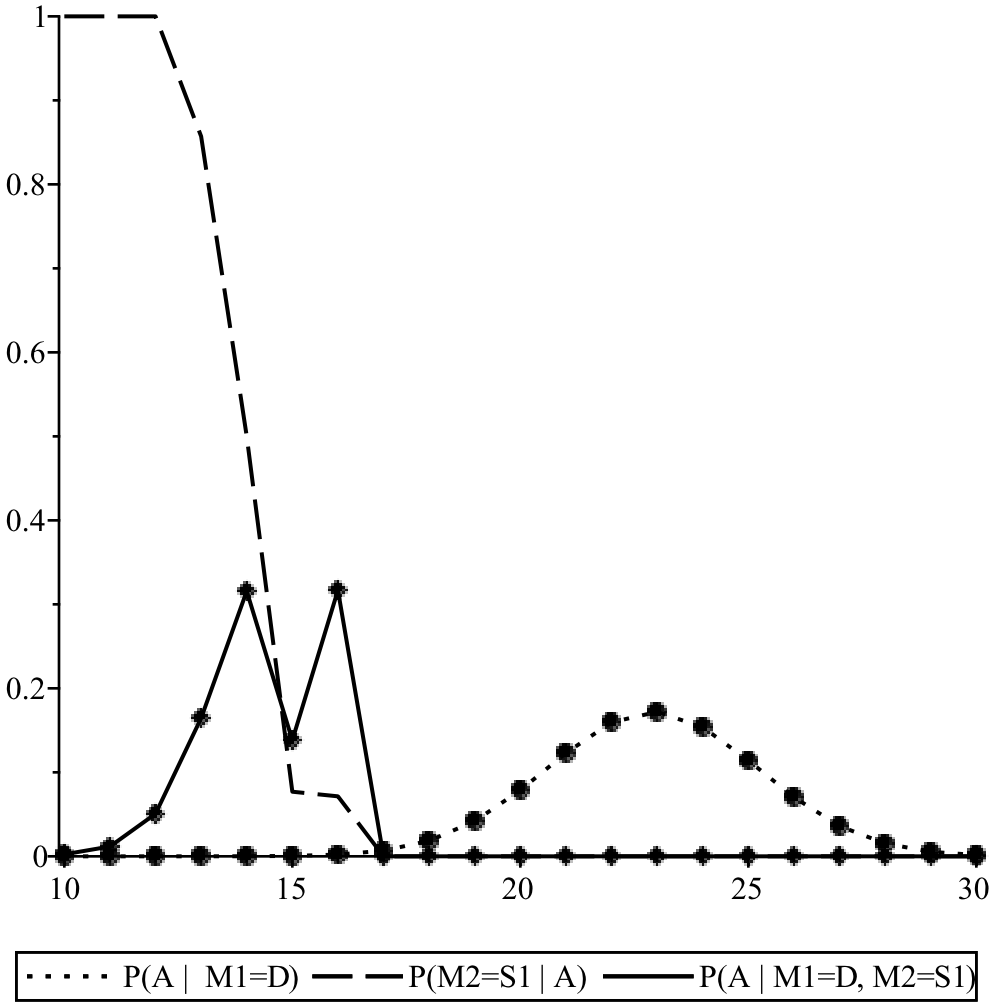
$ny2 := 4$



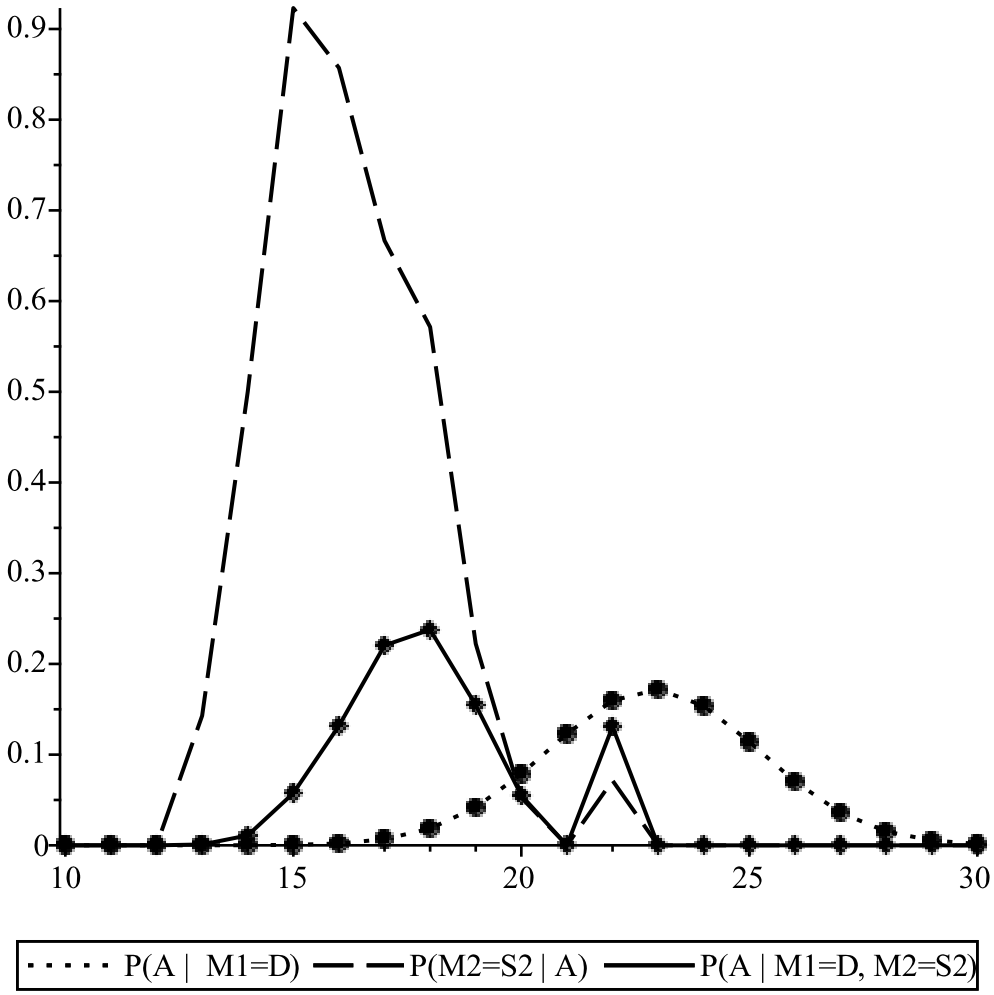
$ny2 := 5$

$ny1 := 4$

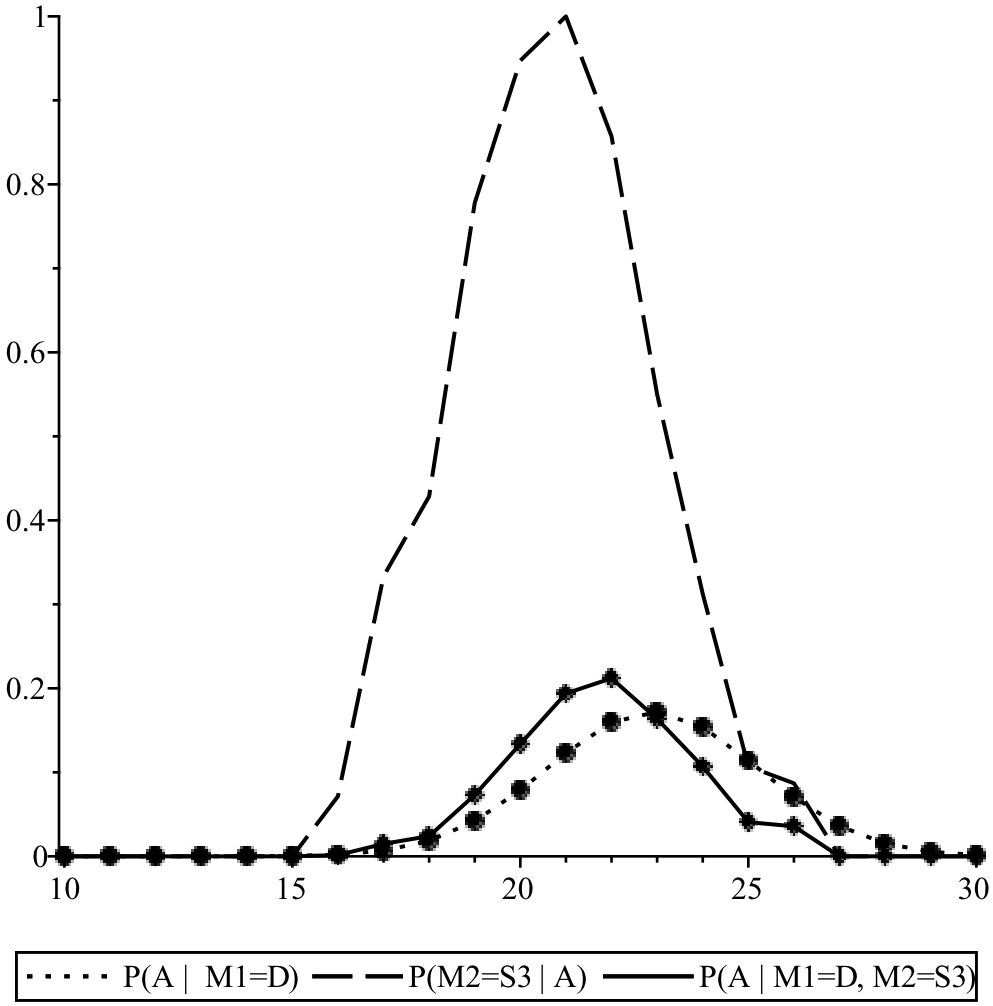
$ny2 := 1$



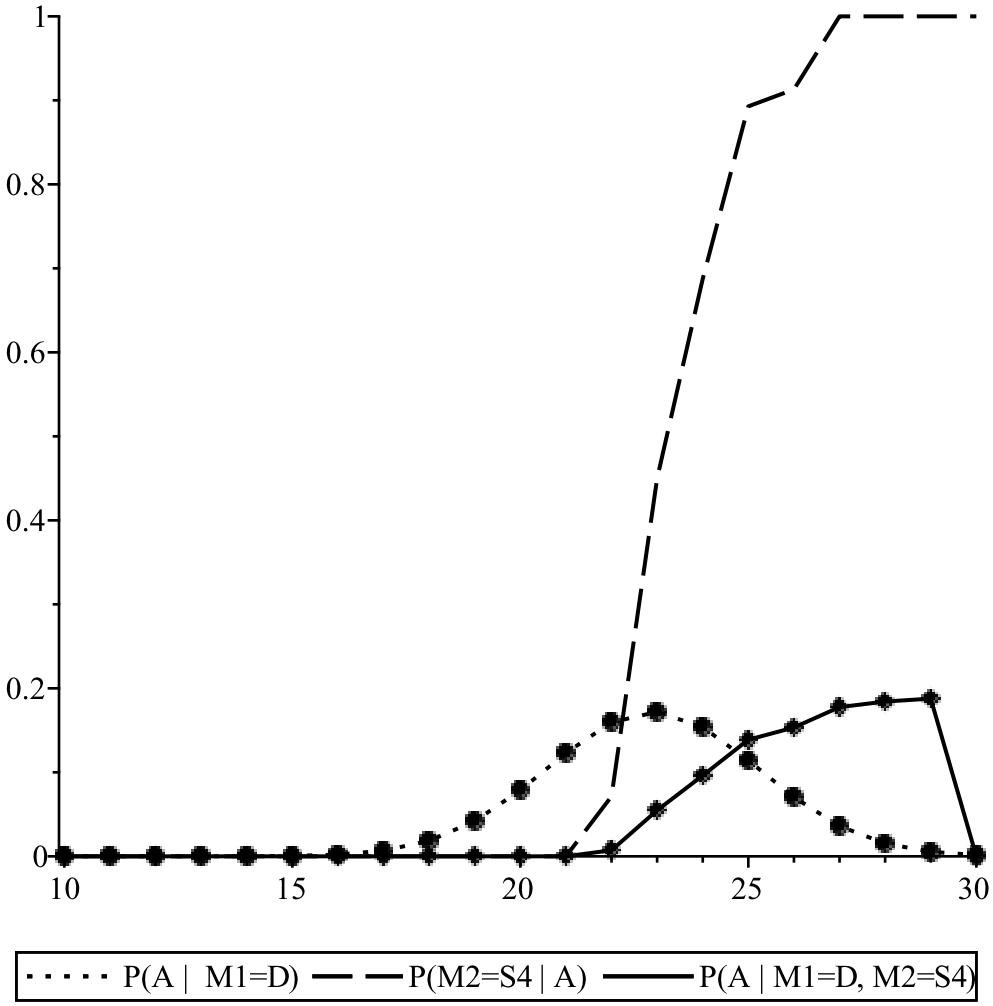
$ny2 := 2$



ny2 := 3



$ny2 := 4$



$$ny2 := 5$$

$$ny1 := 5 \qquad \textbf{(66)}$$

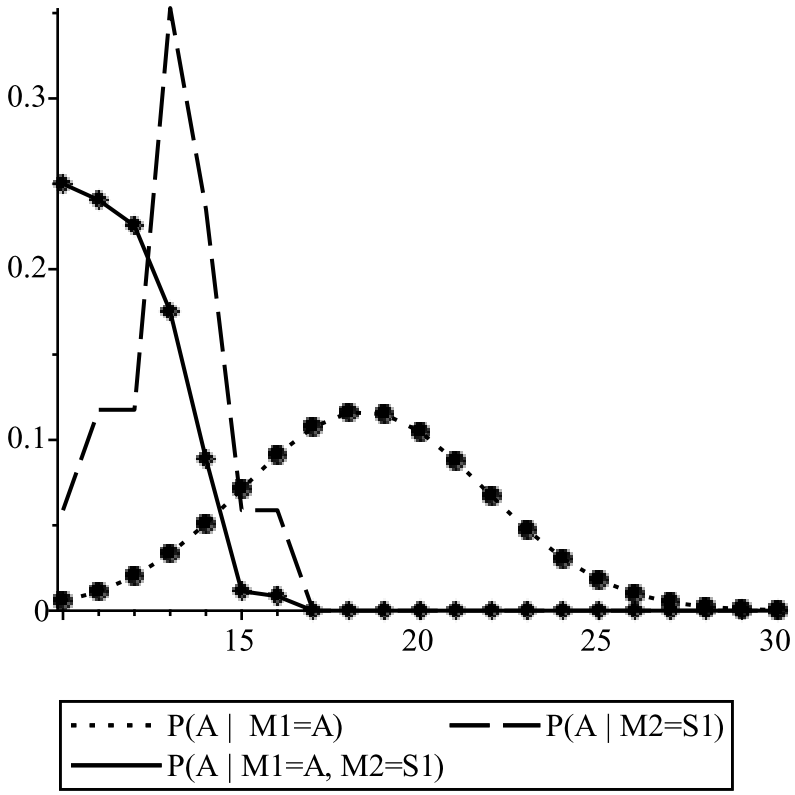
```
for ny1 from 1 to NM18 do
    for ny2 from 1 to NM2 do

            # dataplot(10 .. 30, [PAM[ .., ny2], PAM18[ny1,.. ], PAM118M2[ .., NM2·(ny1 − 1)
 + ny2]], linestyle = [dot, dashdot, solid], color = "black")
            dataplot(AgeGraph, [PAM18[ny1,.. ], PAM[ .., ny2], PAM118M2[ .., NM2·(ny1 − 1)
 + ny2]], linestyle = [dot, dash, solid], color = "black", legend = [typeset("P(A | M1=",
M18Lab[ny1], ") "), typeset("P(A | M2=", M2Lab[ny2], ") "), typeset("P(A | M1=", M18Lab[ny1],
", M2=", M2Lab[ny2], ")") ]);

      end do;
end do;
```

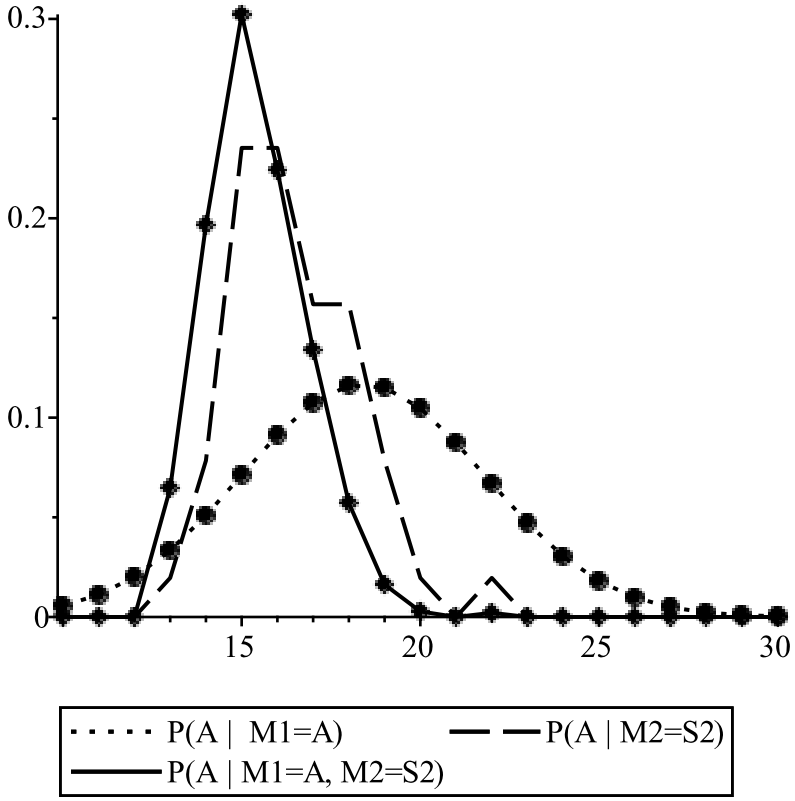
$$ny1 := 1 \qquad \textbf{(67)}$$

$$ny2 := 1 \qquad \textbf{(67)}$$



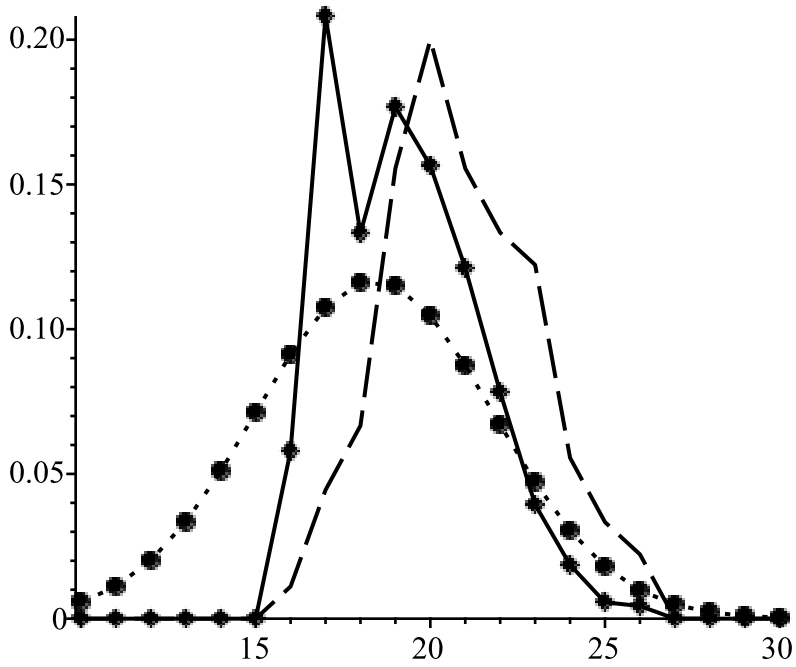
(67)

ny2 := 2 **(67)**



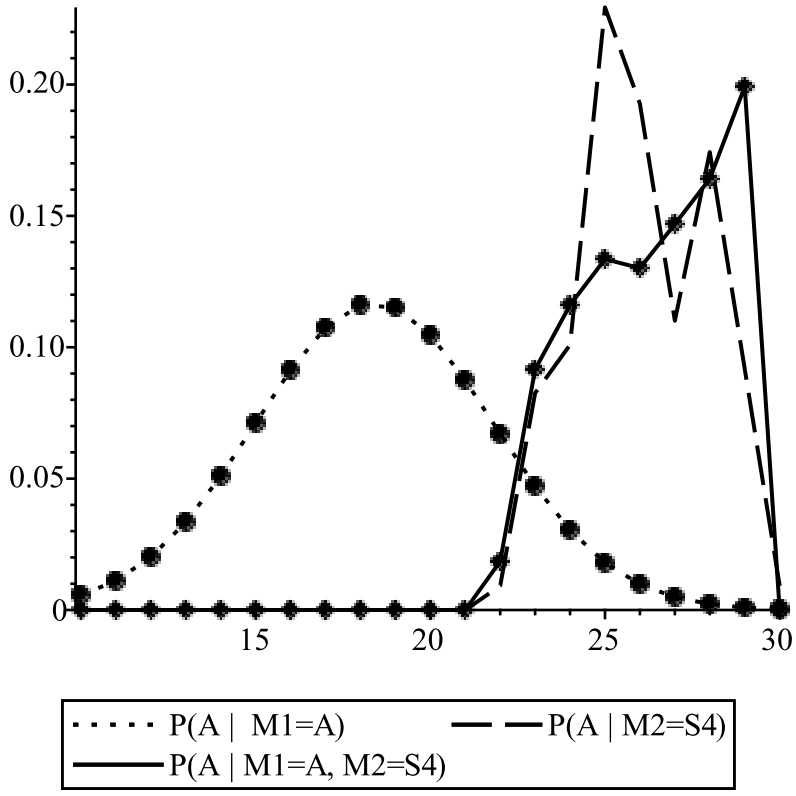
(67)

ny2 := 3 **(67)**



(67)

$ny2 := 4$ (67)

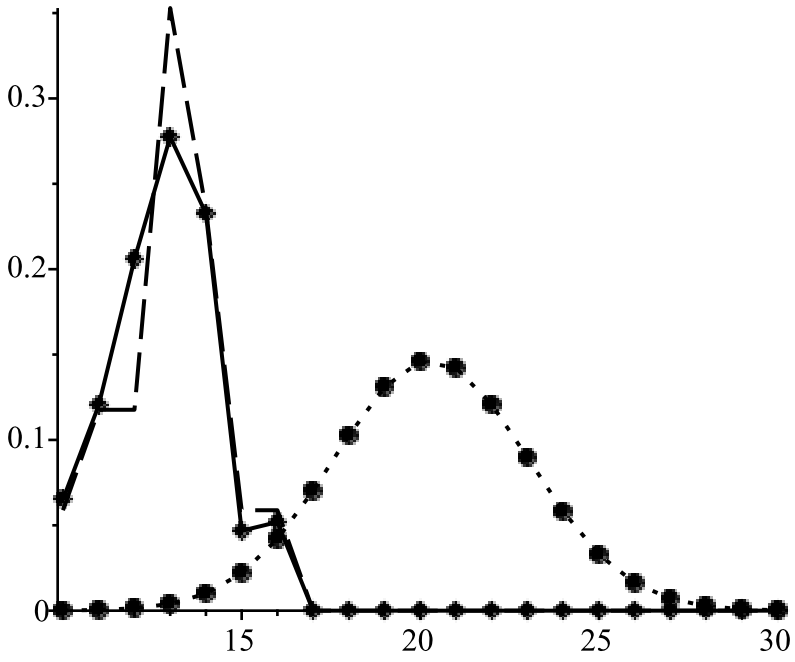


(67)

$ny2 := 5$ (67)

$ny1 := 2$ (67)

$ny2 := 1$ (67)

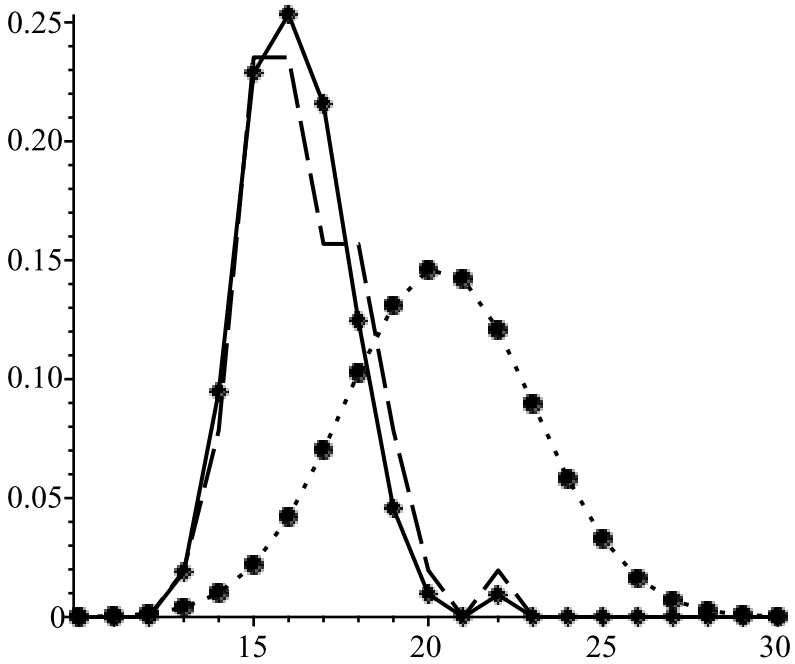


P(A | M1=B) P(A | M2=S1)
P(A | M1=B, M2=S1)

(67)

ny2 := 2

(67)

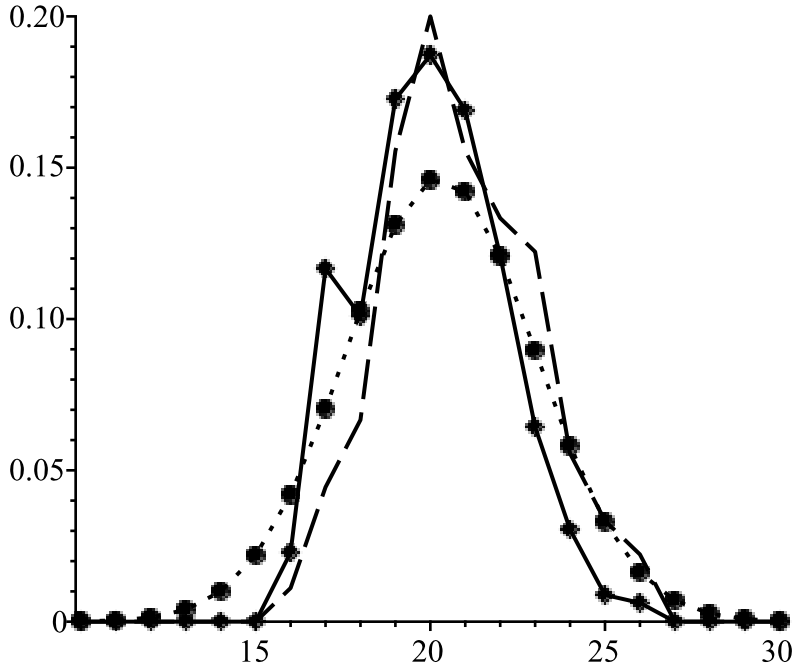


P(A | M1=B) P(A | M2=S2)
P(A | M1=B, M2=S2)

(67)

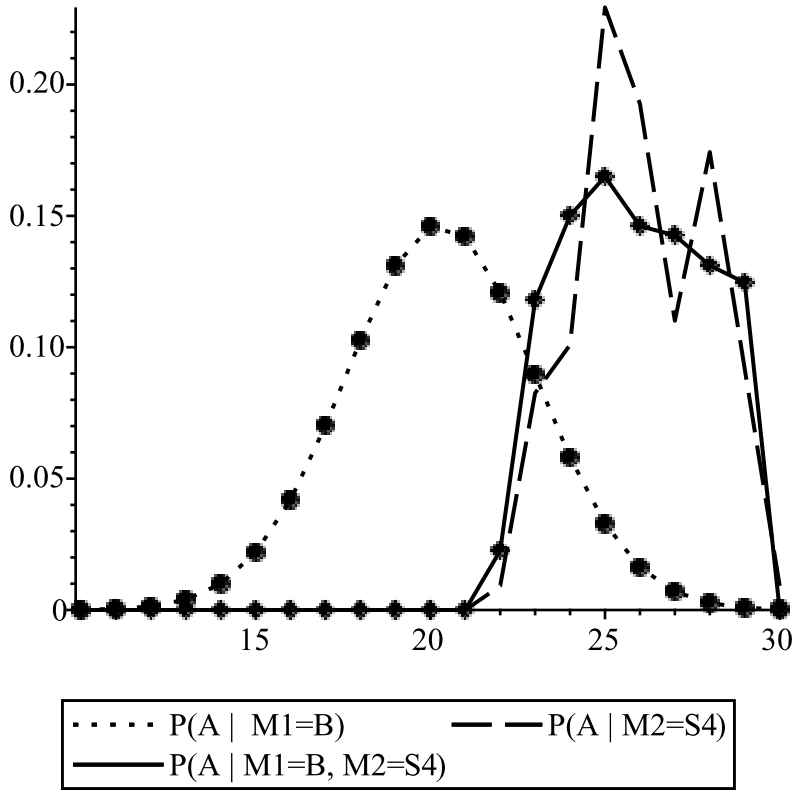
ny2 := 3

(67)



(67)

$ny2 := 4$ **(67)**

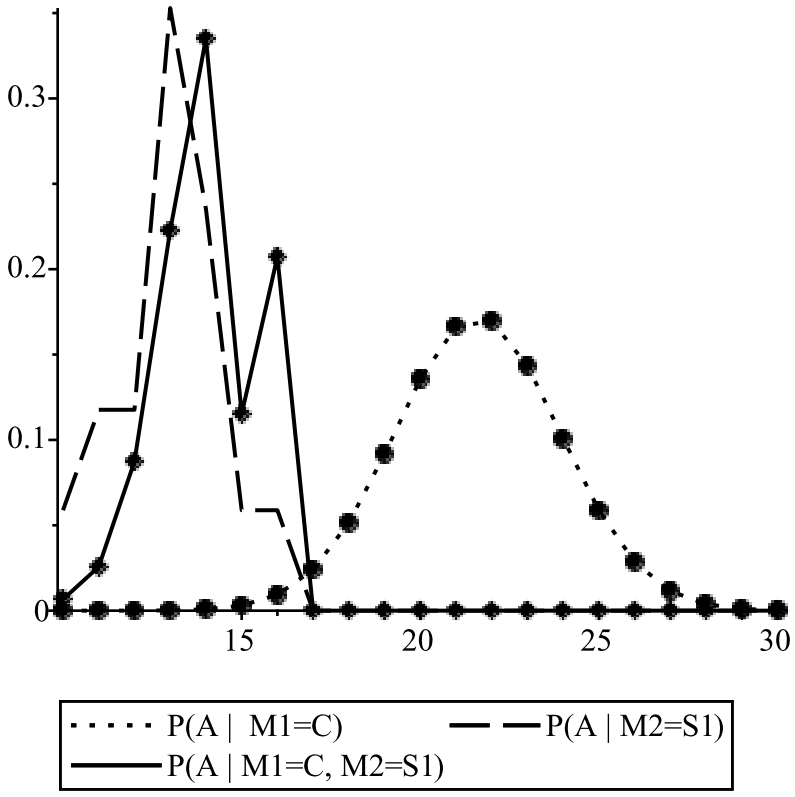


(67)

$ny2 := 5$ **(67)**

$ny1 := 3$ **(67)**

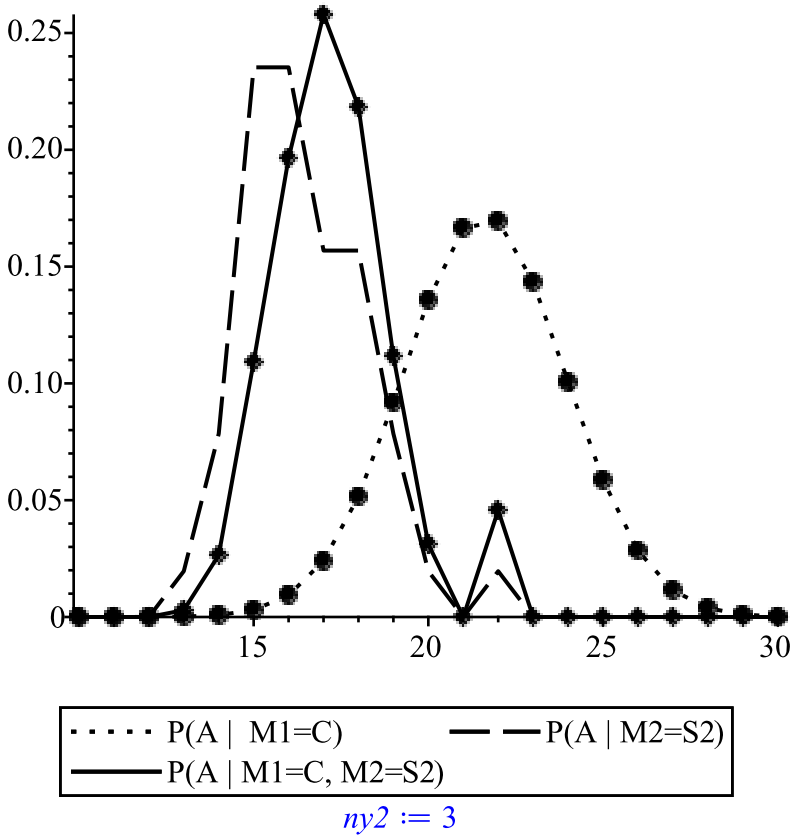
$ny2 := 1$ **(67)**



(67)

ny2 := 2

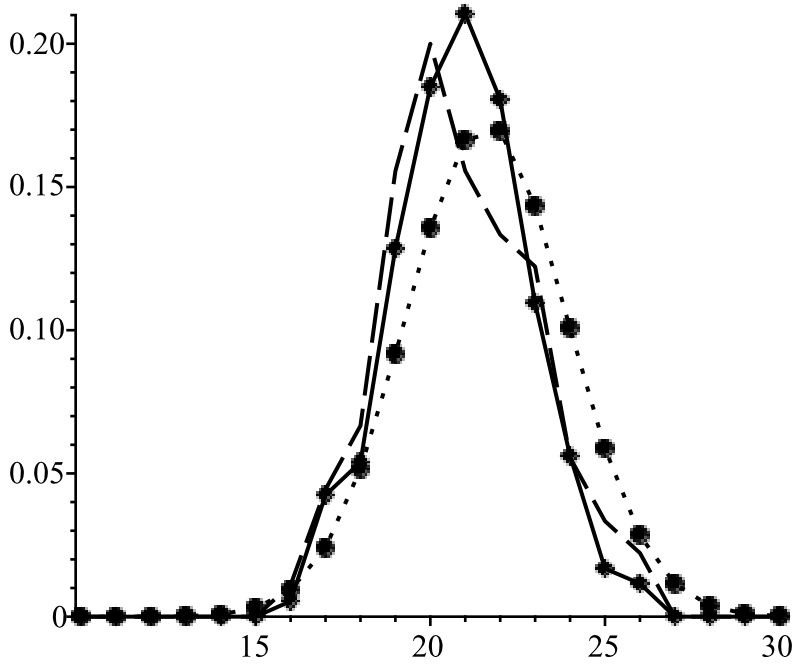
(67)



(67)

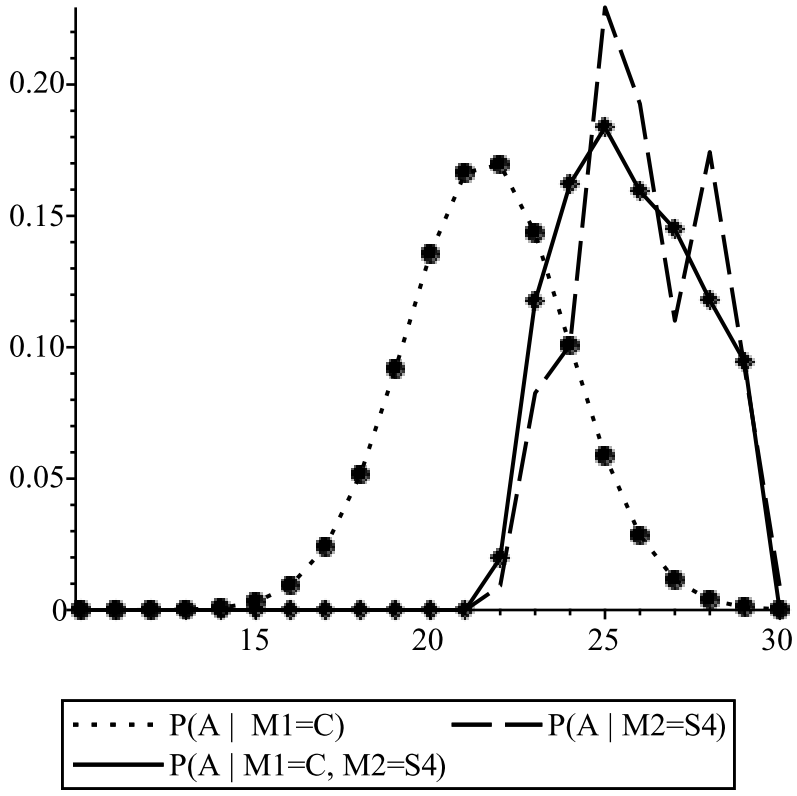
ny2 := 3

(67)



(67)

$ny2 := 4$ **(67)**

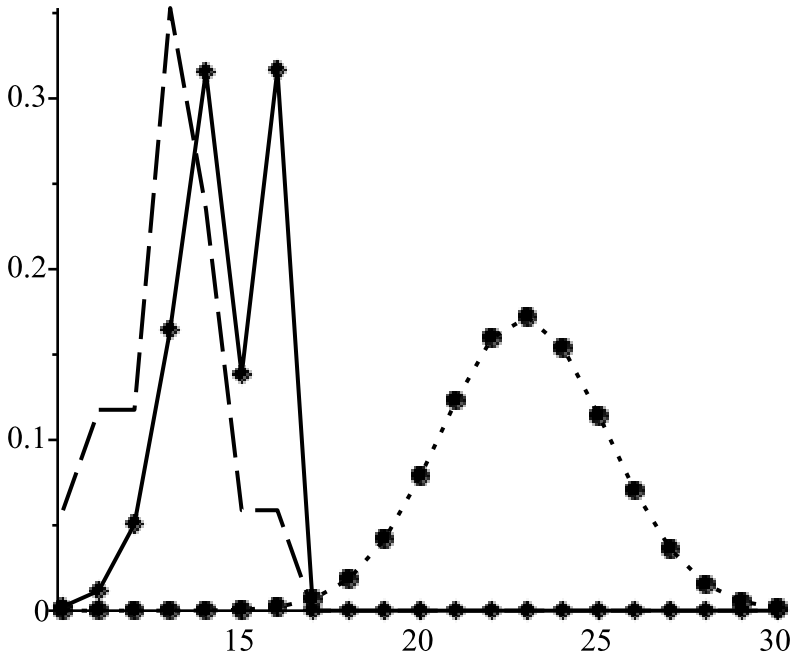


(67)

$ny2 := 5$ **(67)**

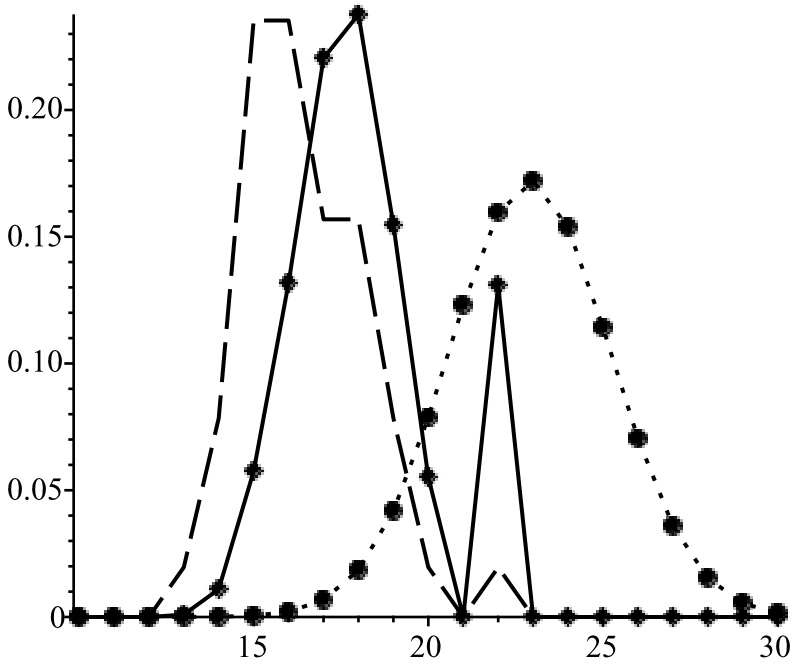
$ny1 := 4$ **(67)**

$ny2 := 1$ **(67)**



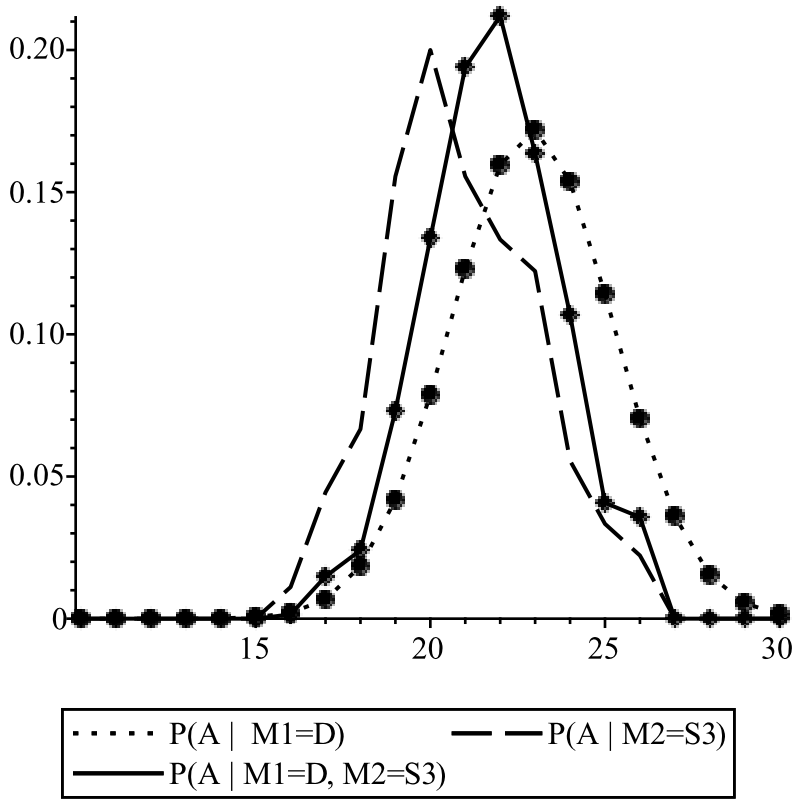
(67)

ny2 := 2 (67)



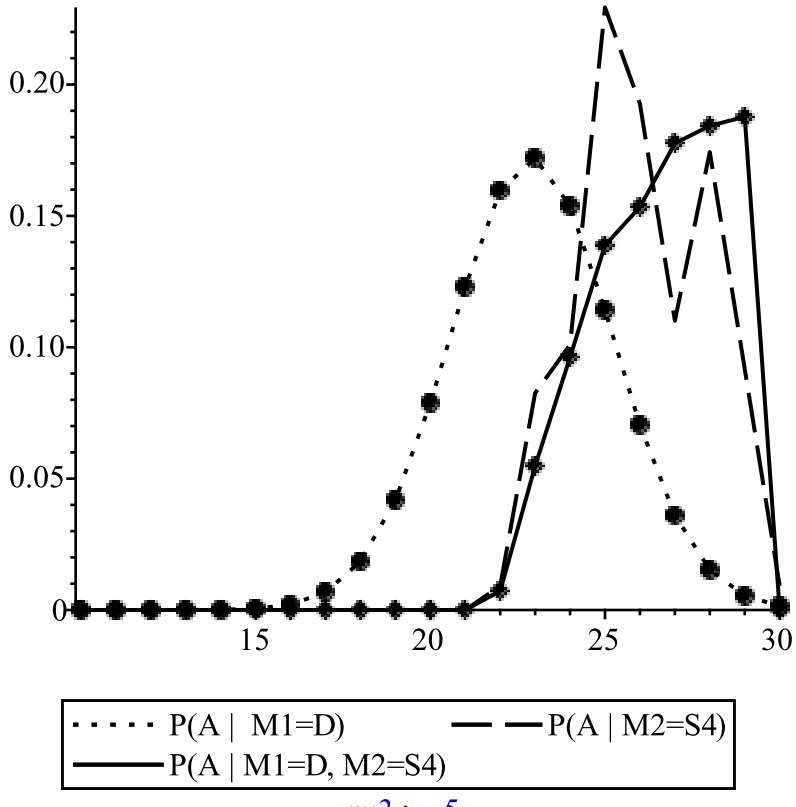
(67)

ny2 := 3 (67)



(67)

ny2 := 4 **(67)**



(67)

ny2 := 5 **(67)**

ny1 := 5 **(67)**

for *ny1* **from** *1* ***to*** *NM18* ***do***

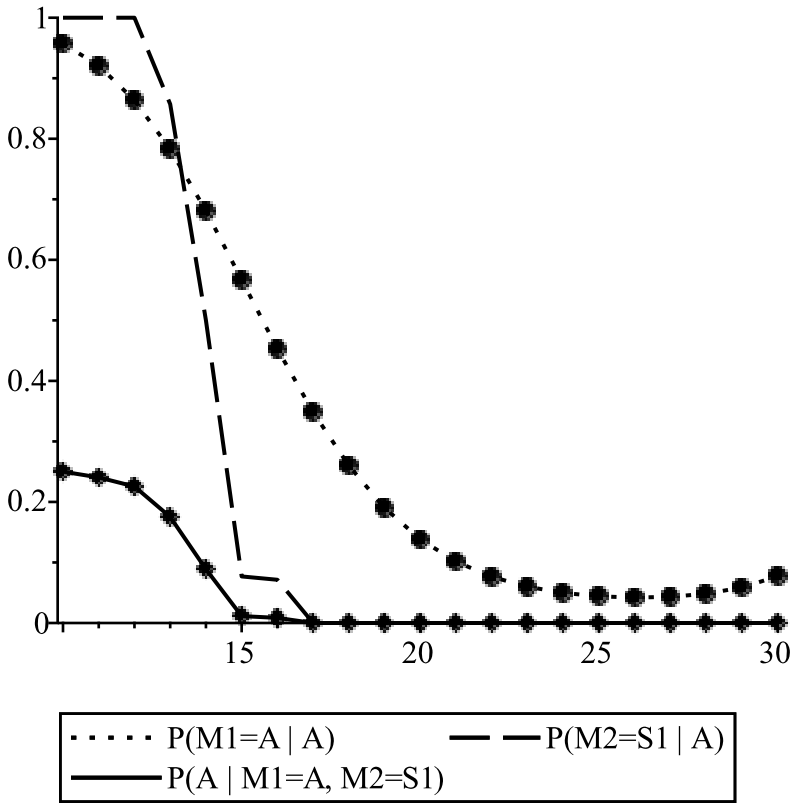
for *ny2* **from** 1 **to** *NM2* **do**

dataplot(*AgeGraph*, [*PM18A*[.., *ny1*], *PMA*[.., *ny2*], *PAM118M2*[.., *NM2*·(*ny1* − 1) + *ny2*]], *linestyle* = [*dot*, *dash*, *solid*], *color* = "black", *legend* = [*typeset*("P(M1=", *M18Lab*[*ny1*], " | A) "), *typeset*("P(M2=", *M2Lab*[*ny2*], " | A) "), *typeset*("P(A | M1=", *M18Lab*[*ny1*], ", M2=", *M2Lab*[*ny2*], ")")]);

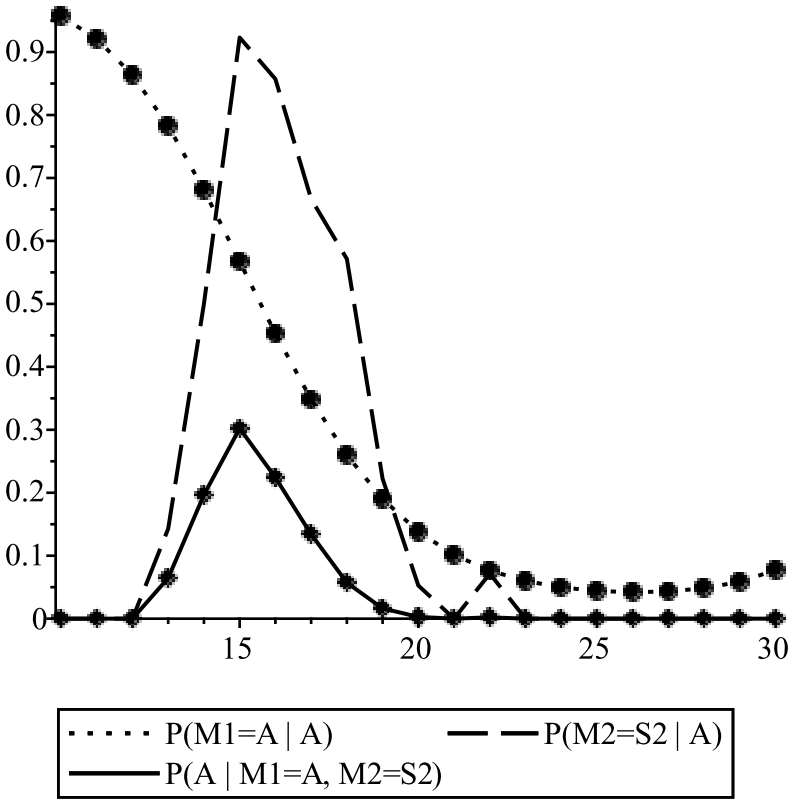
end do;
end do;

ny1 := 1

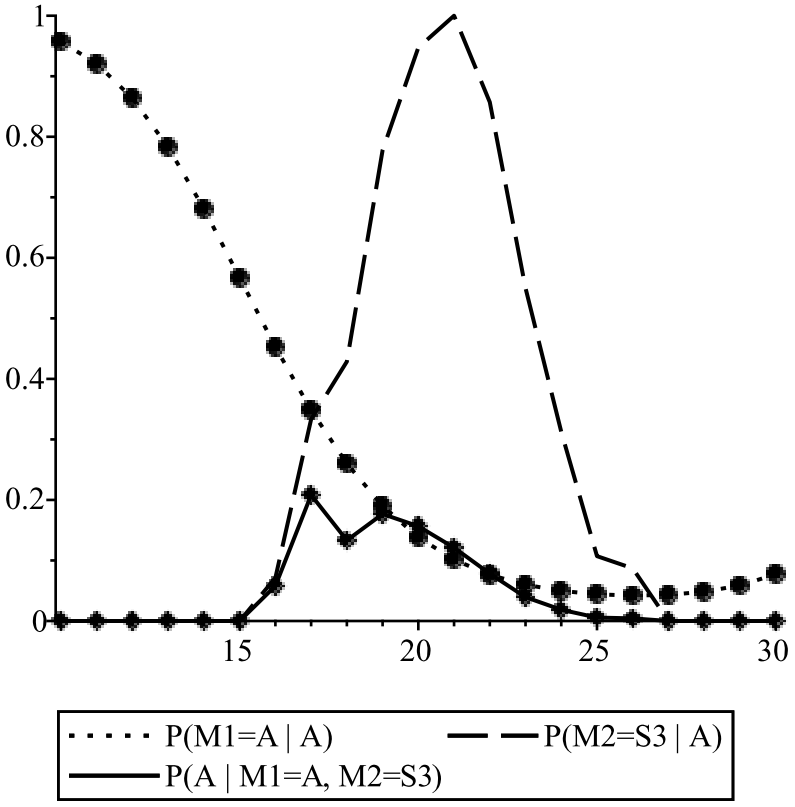
ny2 := 1



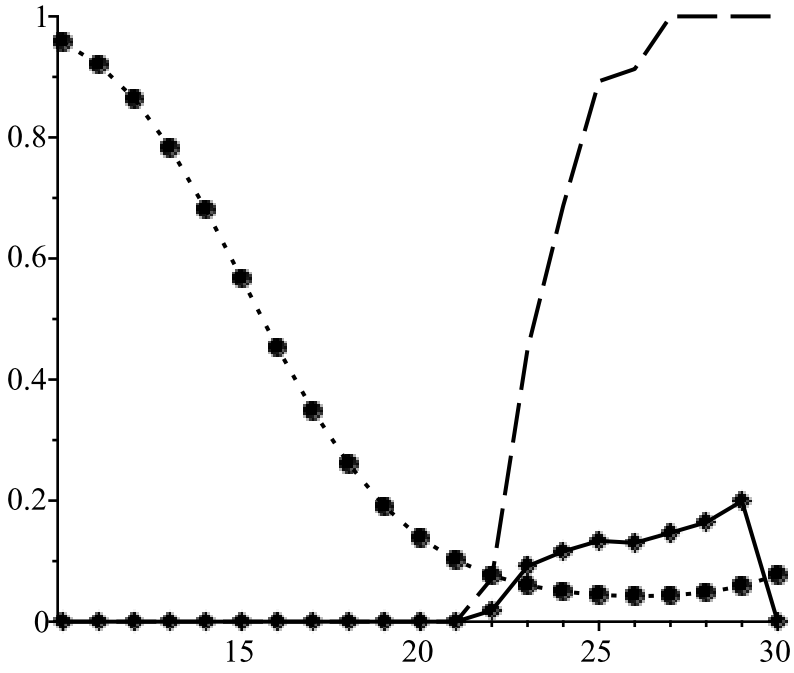
ny2 := 2


0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
15
20
25
30
P(M1=A | A)
P(M2=S2 | A)
P(A | M1=A, M2=S2)

ny2 := 3


1
0.8
0.6
0.4
0.2
0
15
20
25
30
P(M1=A | A)
P(M2=S3 | A)
P(A | M1=A, M2=S3)

ny2 := 4

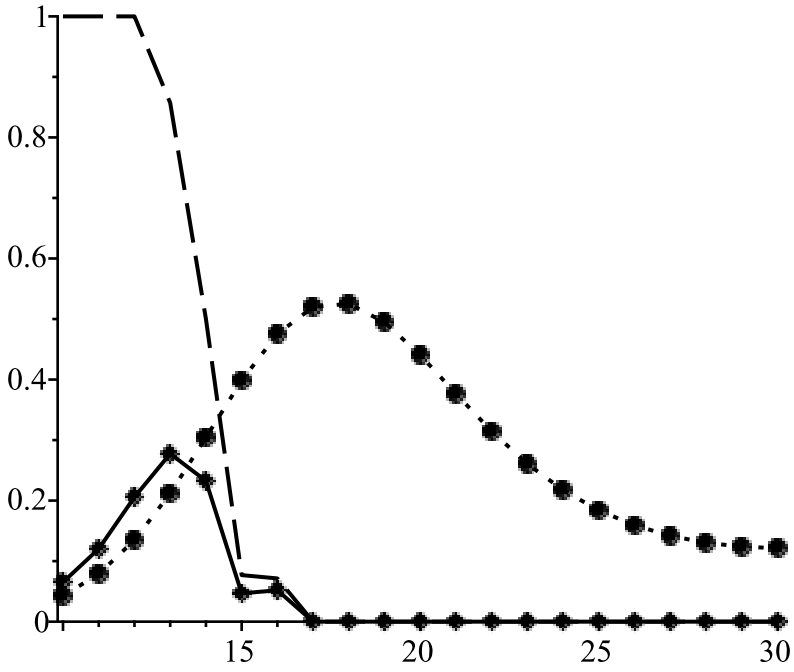


P(M1=A | A) P(M2=S4 | A)
P(A | M1=A, M2=S4)

ny2 := 5

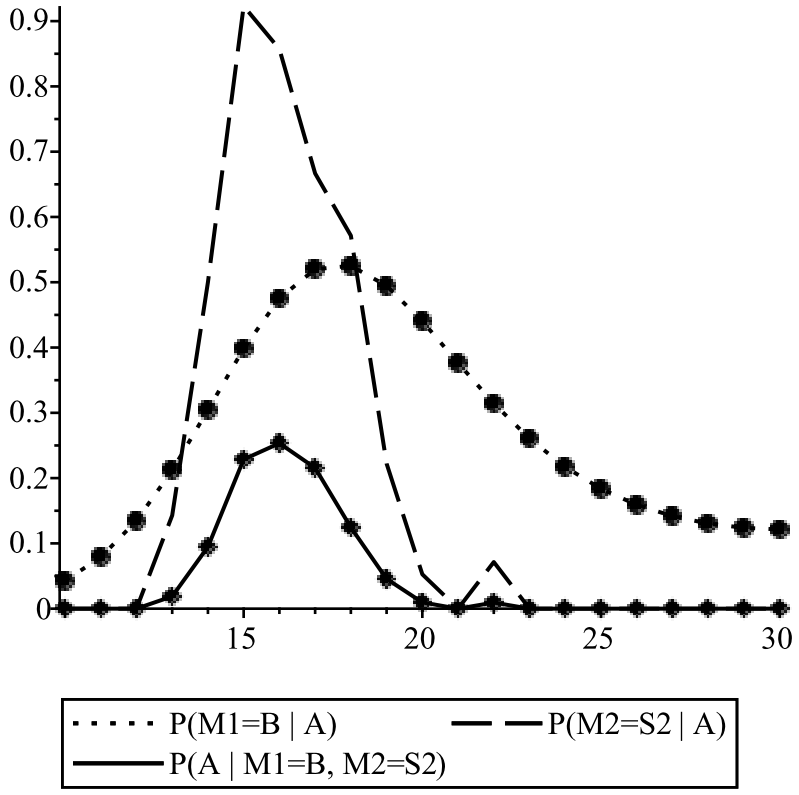
ny1 := 2

ny2 := 1

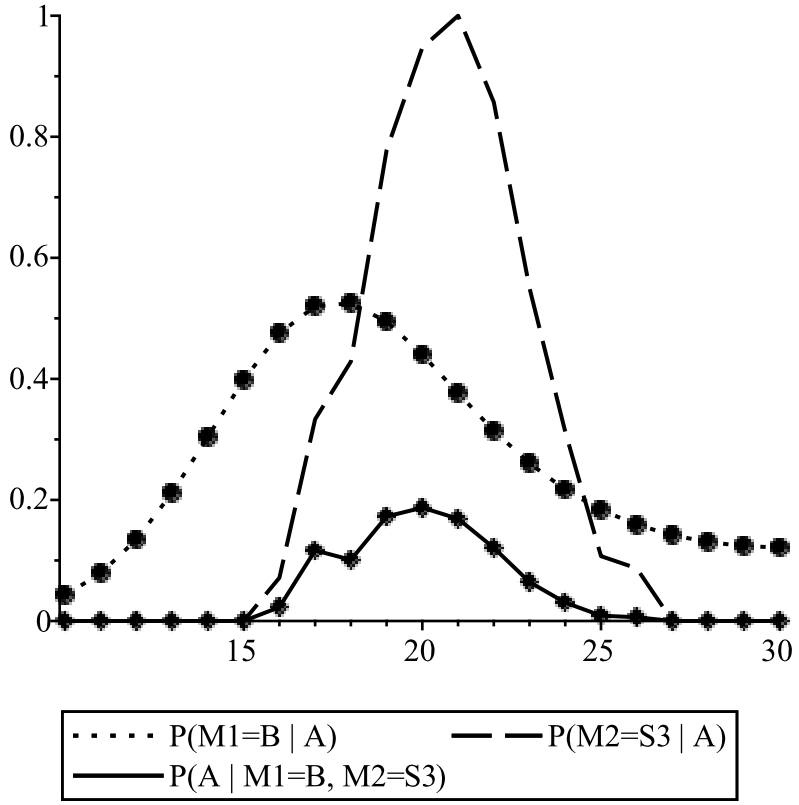


P(M1=B | A) P(M2=S1 | A)
P(A | M1=B, M2=S1)

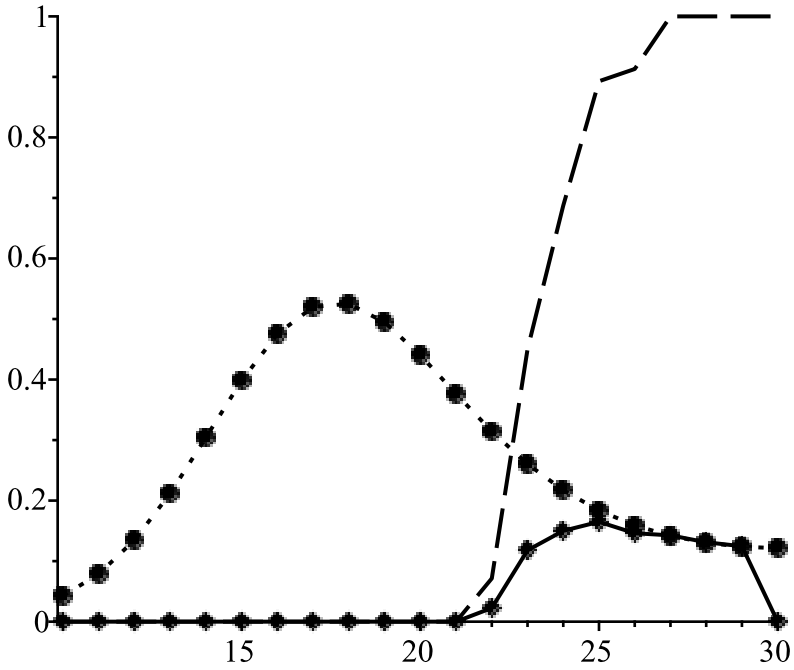
ny2 := 2


0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
15
20
25
30
P(M1=B | A)
P(M2=S2 | A)
P(A | M1=B, M2=S2)

ny2 := 3


1
0.8
0.6
0.4
0.2
0
15
20
25
30
P(M1=B | A)
P(M2=S3 | A)
P(A | M1=B, M2=S3)

ny2 := 4

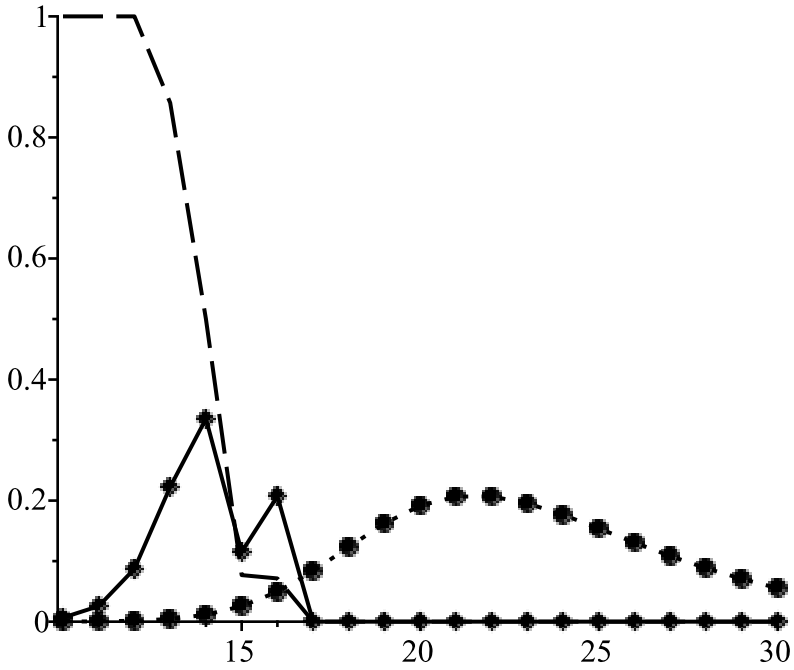


P(M1=B | A) P(M2=S4 | A)
P(A | M1=B, M2=S4)

ny2 := 5

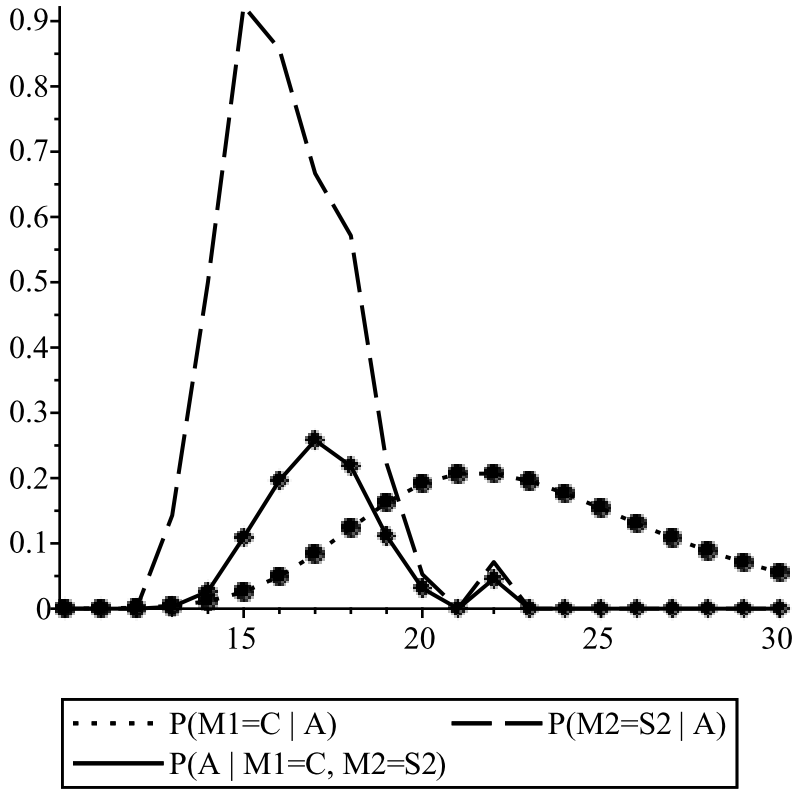
ny1 := 3

ny2 := 1

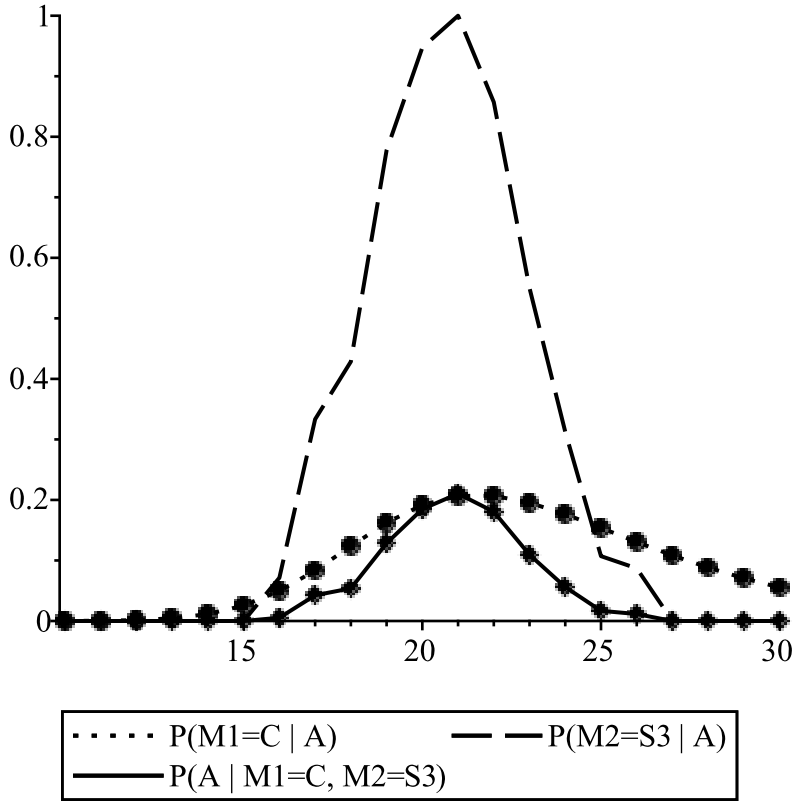


P(M1=C | A) P(M2=S1 | A)
P(A | M1=C, M2=S1)

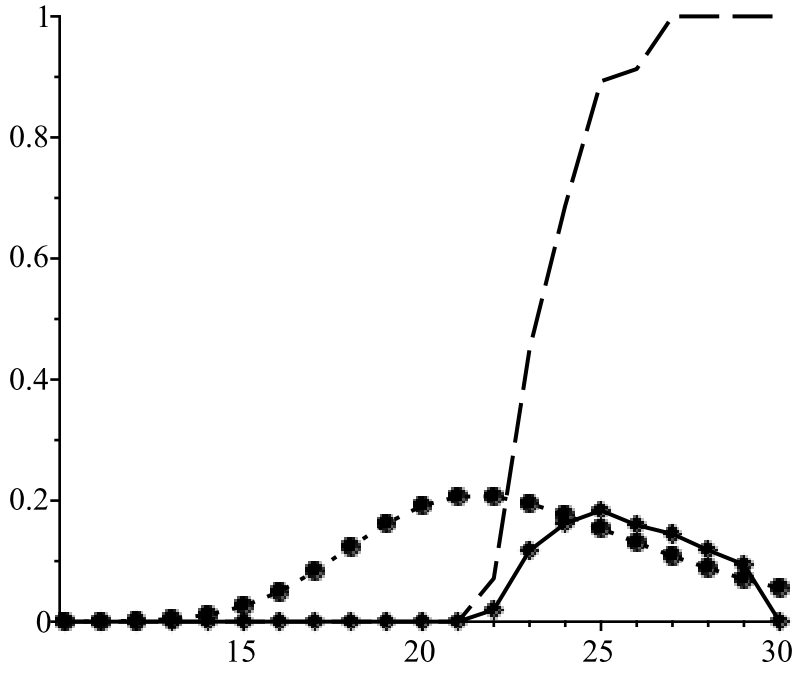
ny2 := 2


0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
15
20
25
30
P(M1=C | A)
P(M2=S2 | A)
P(A | M1=C, M2=S2)

ny2 := 3


1
0.8
0.6
0.4
0.2
0
15
20
25
30
P(M1=C | A)
P(M2=S3 | A)
P(A | M1=C, M2=S3)

ny2 := 4

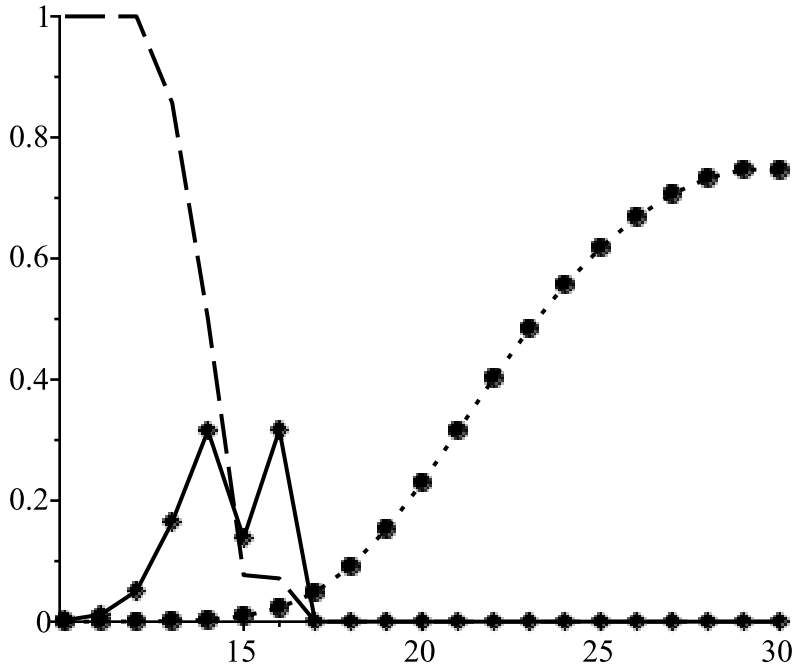


P(M1=C | A) P(M2=S4 | A)
P(A | M1=C, M2=S4)

ny2 := 5

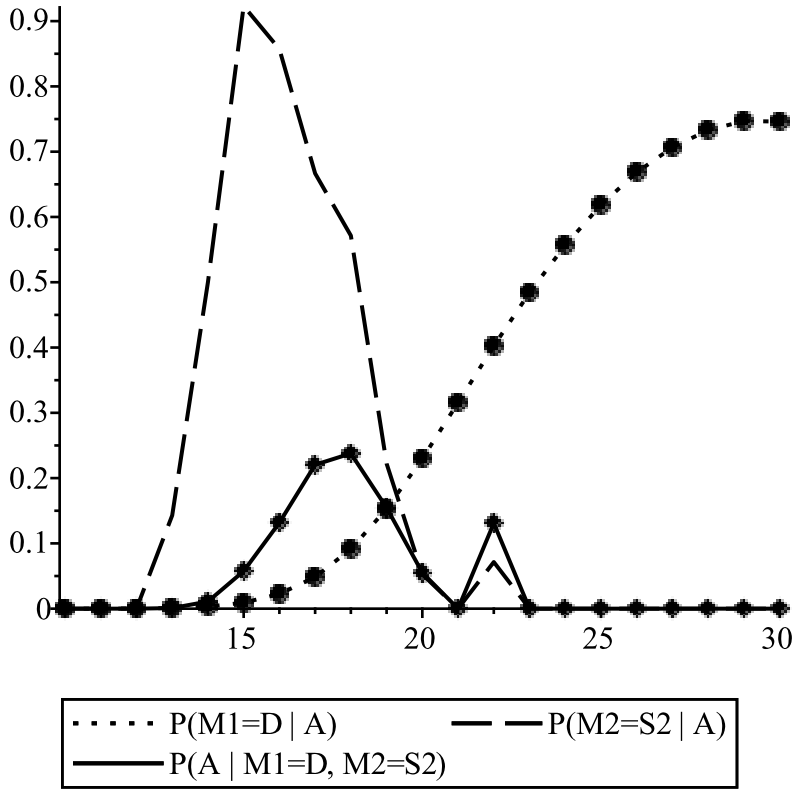
ny1 := 4

ny2 := 1

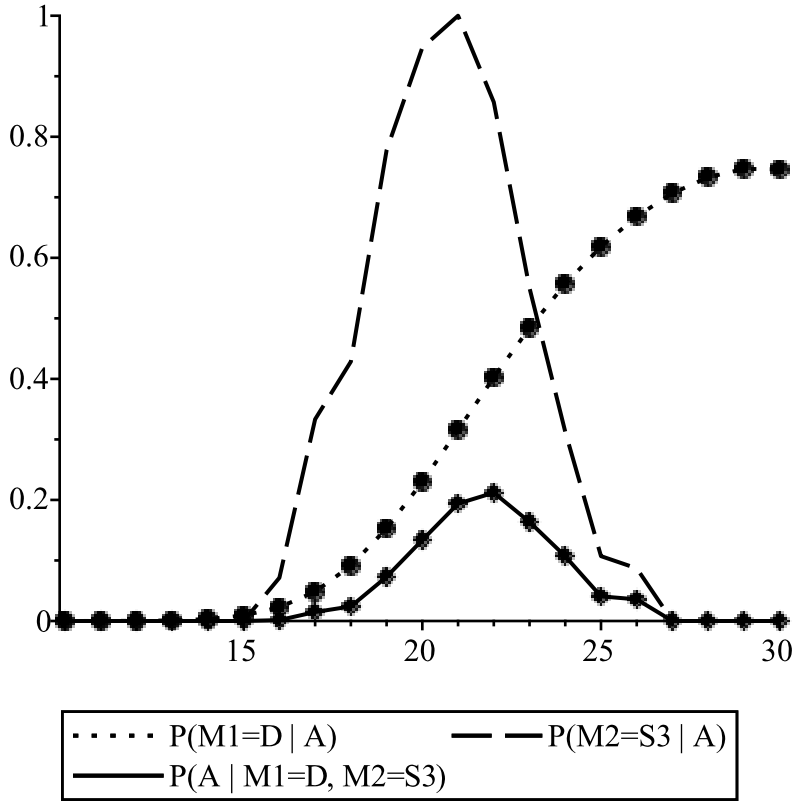


P(M1=D | A) P(M2=S1 | A)
P(A | M1=D, M2=S1)

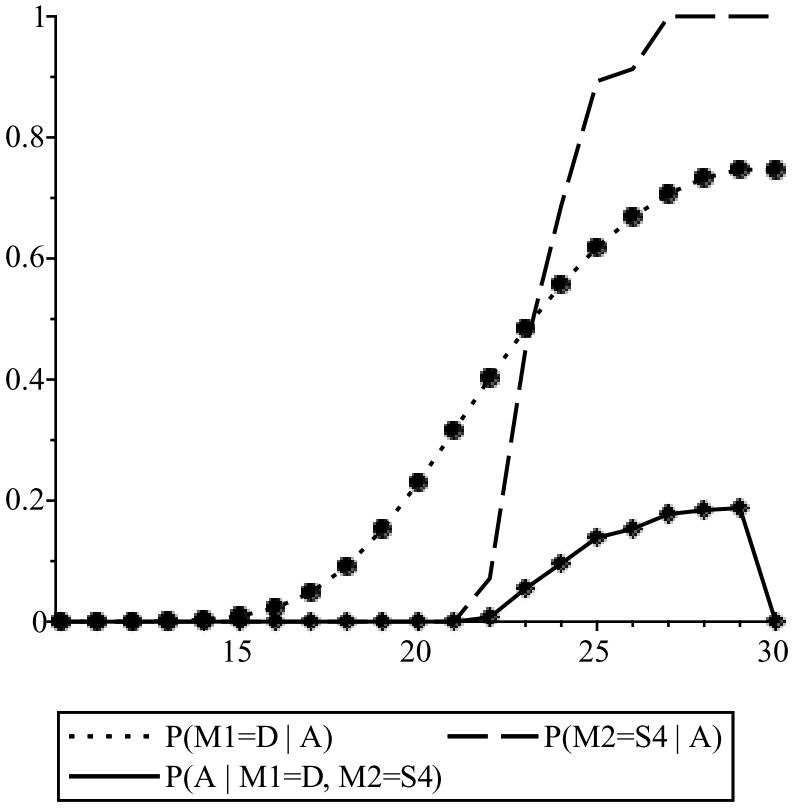
ny2 := 2


0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
15
20
25
30
P(M1=D | A)
P(M2=S2 | A)
P(A | M1=D, M2=S2)

ny2 := 3


1
0.8
0.6
0.4
0.2
0
15
20
25
30
P(M1=D | A)
P(M2=S3 | A)
P(A | M1=D, M2=S3)

ny2 := 4



$ny2 := 5$

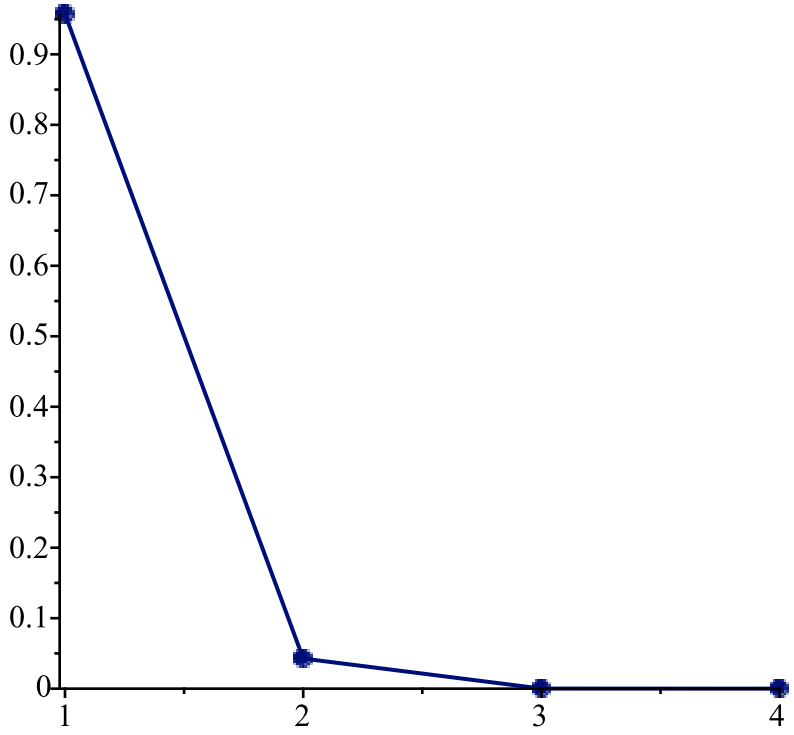
$ny1 := 5$ **(68)**

for *nx* **from** *1* ***to*** *NA* ***do***

dataplot(*PM18A*[*nx*,..], *caption* = *typeset*("Output P(M18 | A=", *nx* + *AMinAlt*, ")"));

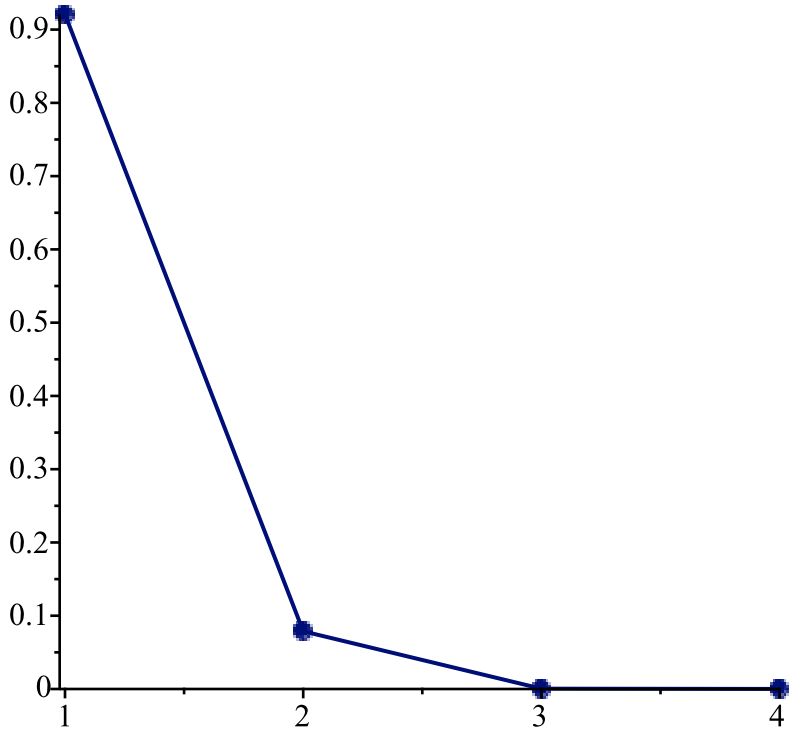
end do;

$nx := 1$



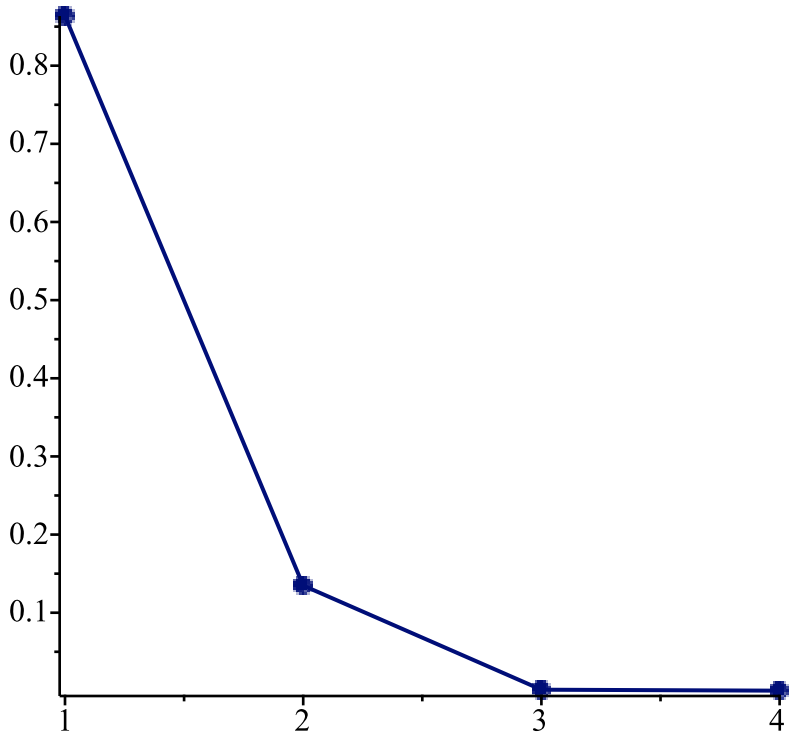
Output P(M18 | A=13)

$nx := 2$



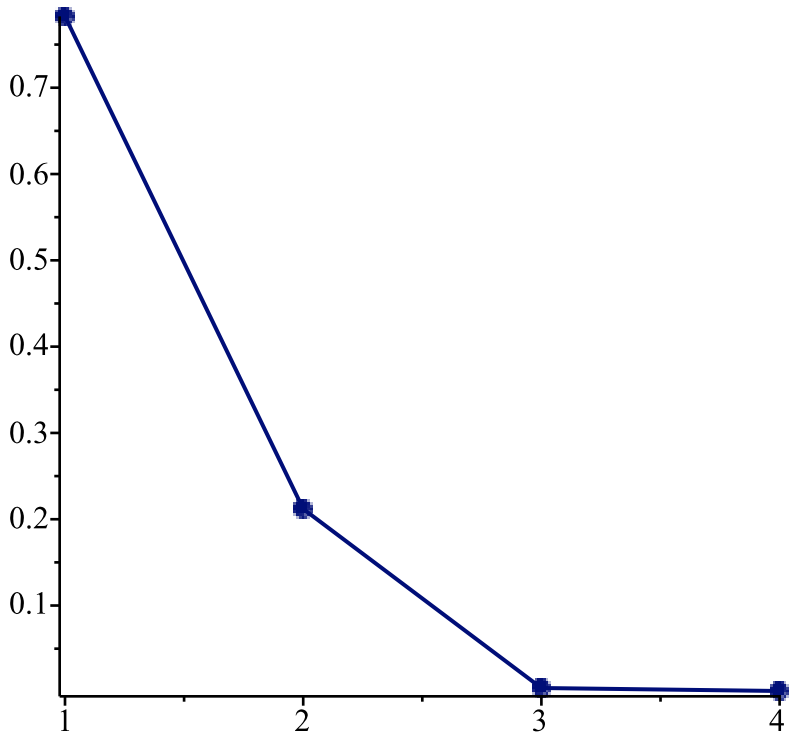
Output P(M18 | A=14)

$nx := 3$



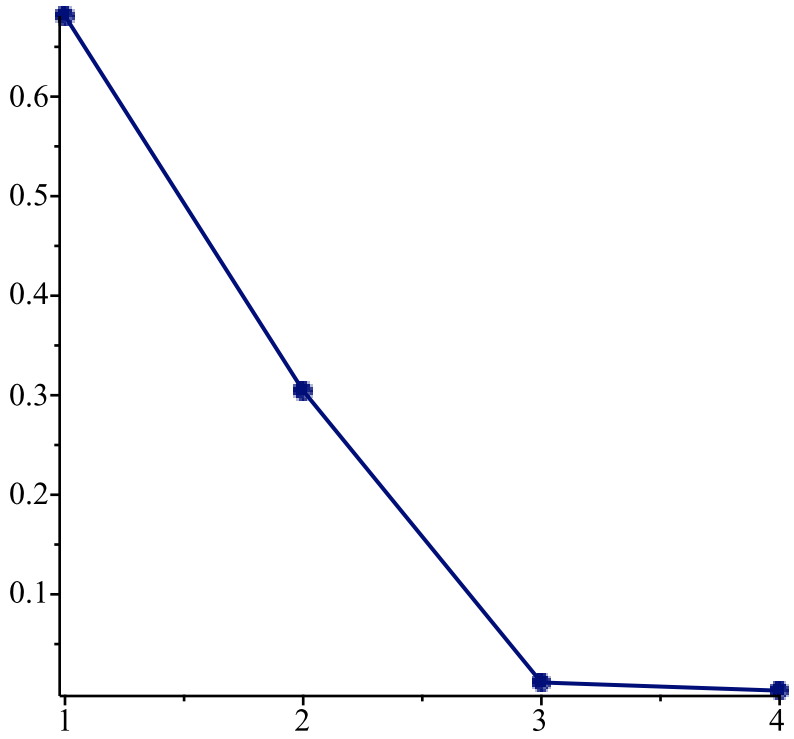
Output P(M18 | A=15)

$nx := 4$



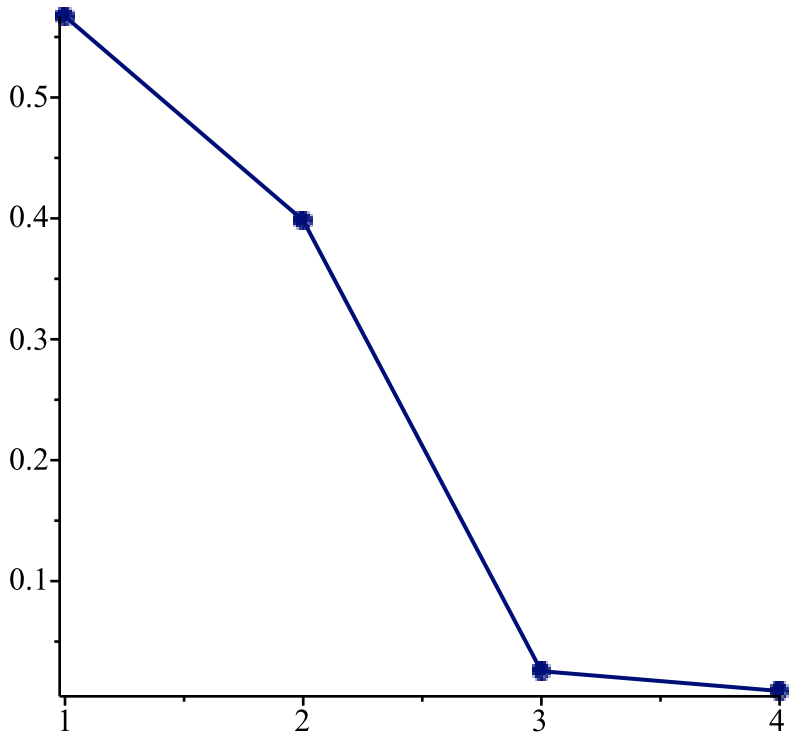
Output P(M18 | A=16)

$nx := 5$



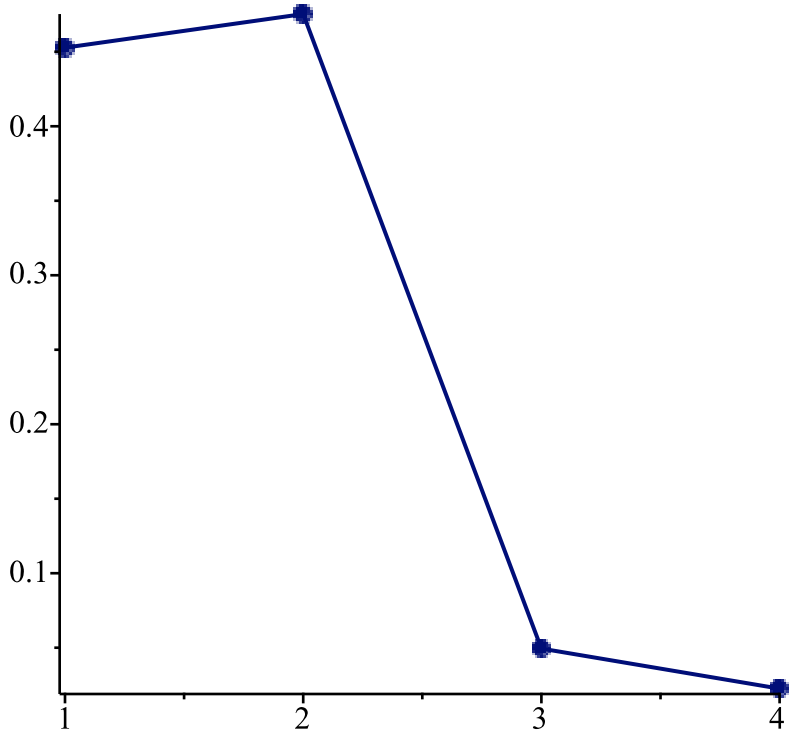
Output P(M18 | A=17)

$nx := 6$



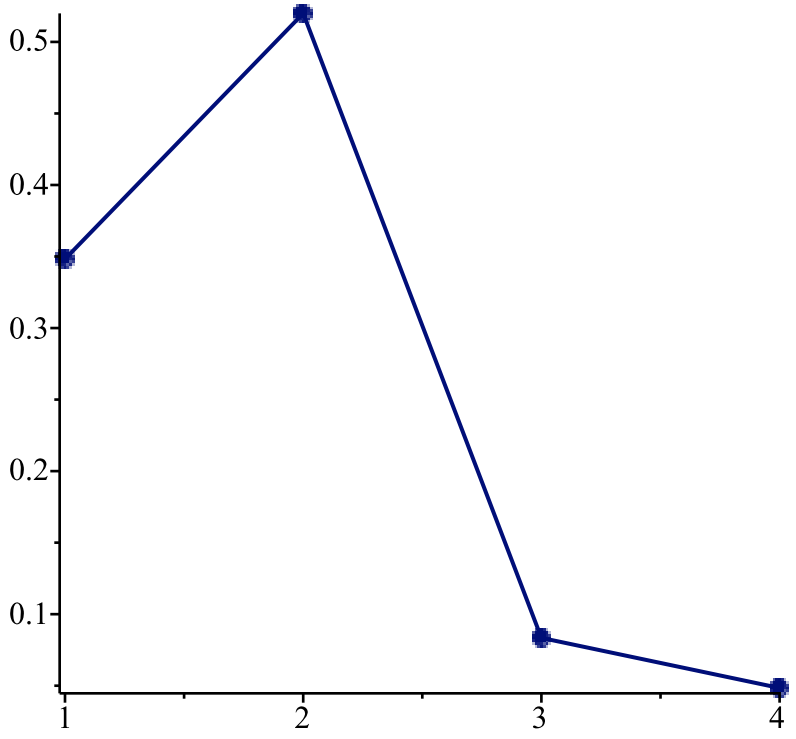
Output P(M18 | A=18)

$nx := 7$



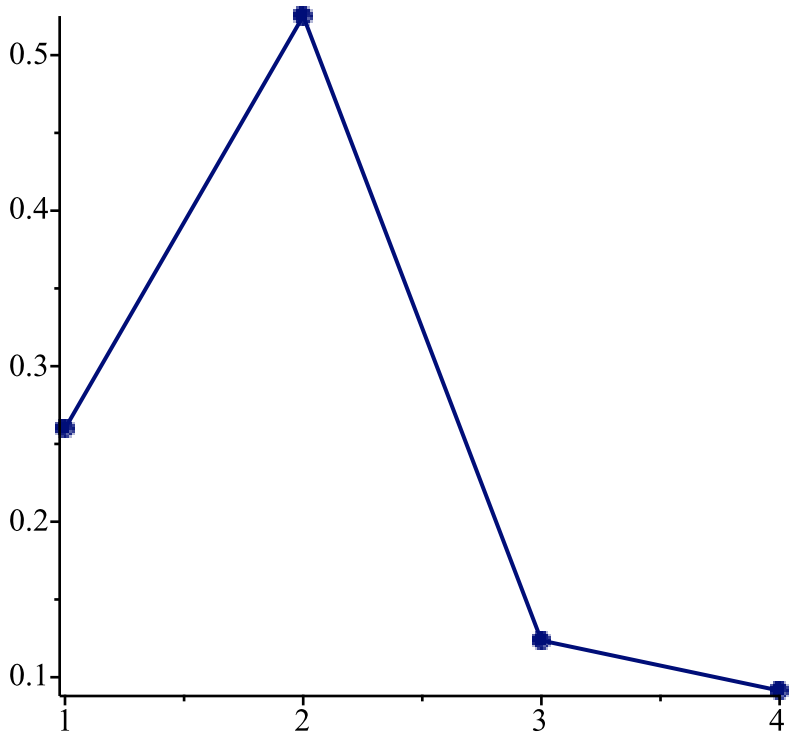
Output P(M18 | A=19)

$nx := 8$



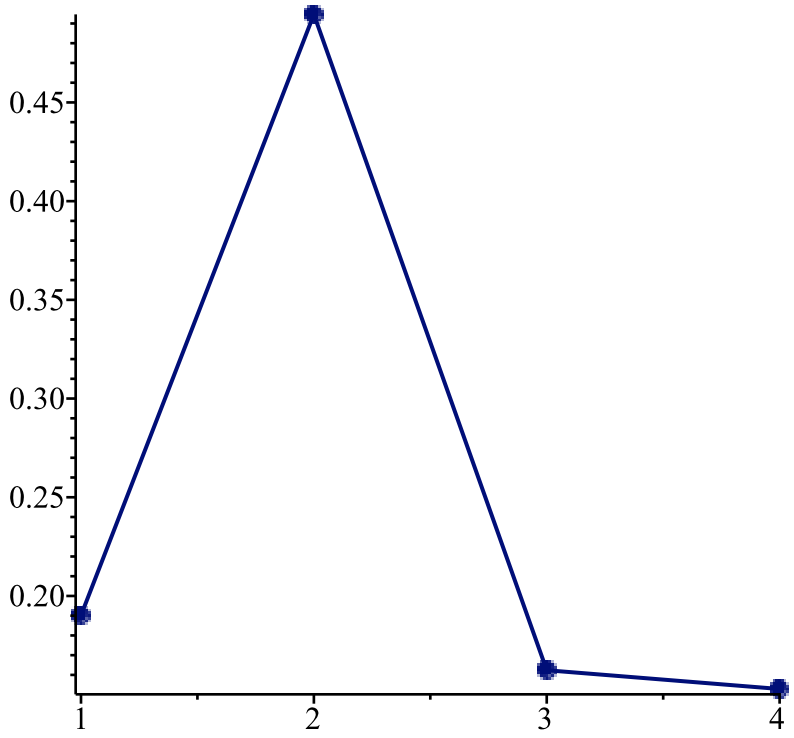
Output P(M18 | A=20)

$nx := 9$



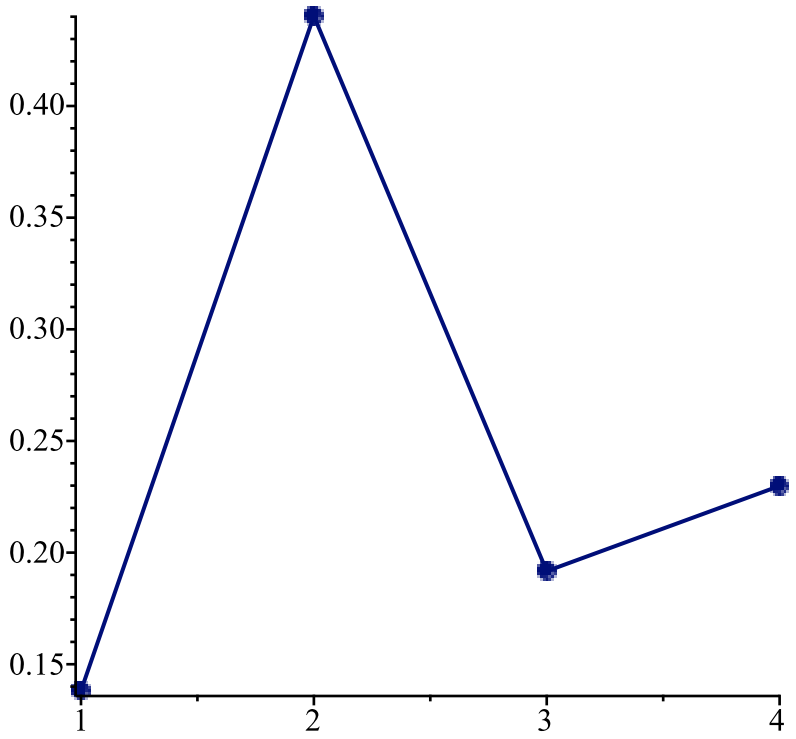
Output P(M18 | A=21)

$nx := 10$



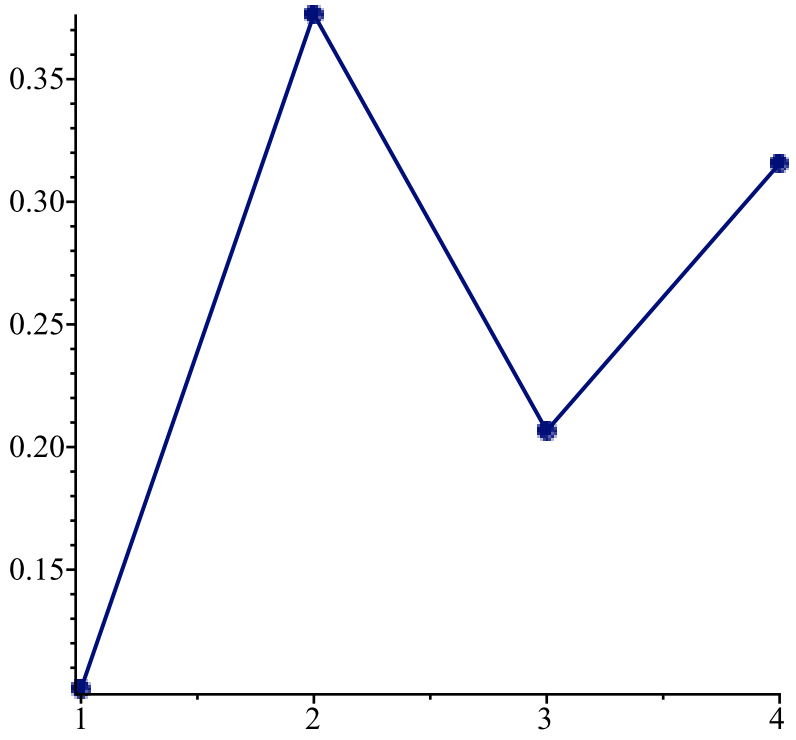
Output P(M18 | A=22)

$nx := 11$



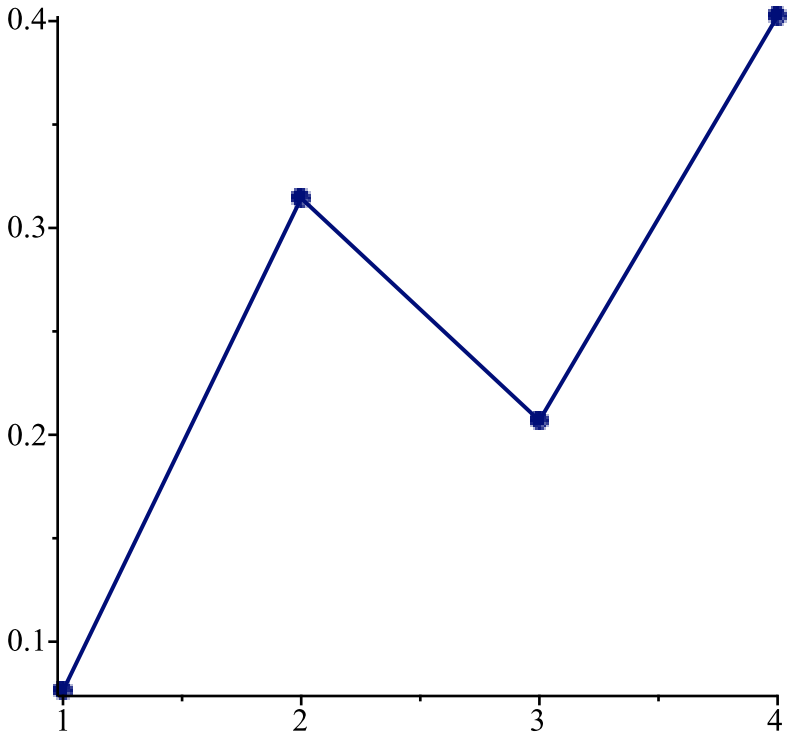
Output P(M18 | A=23)

$nx := 12$



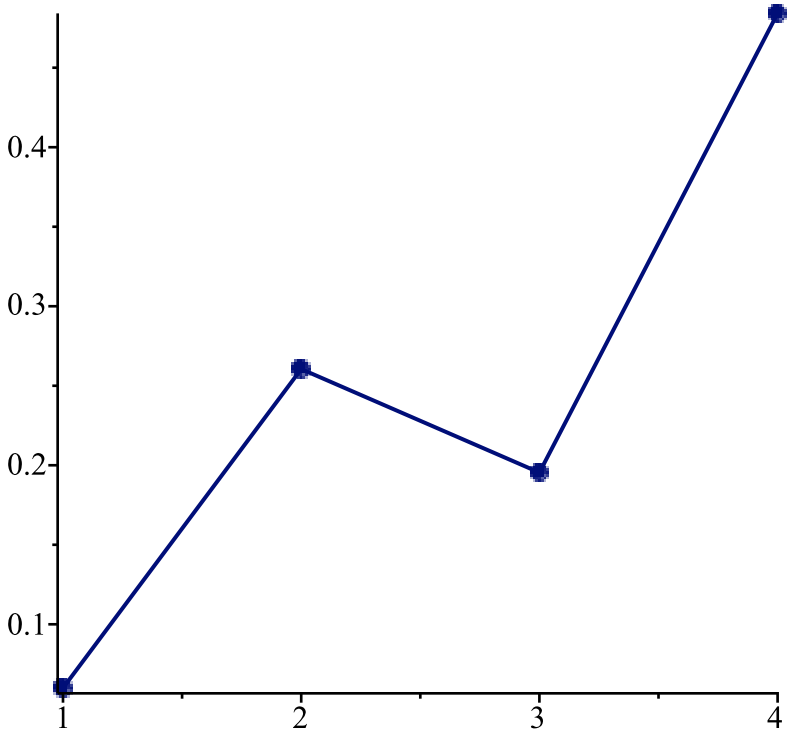
Output P(M18 | A=24)

$nx := 13$



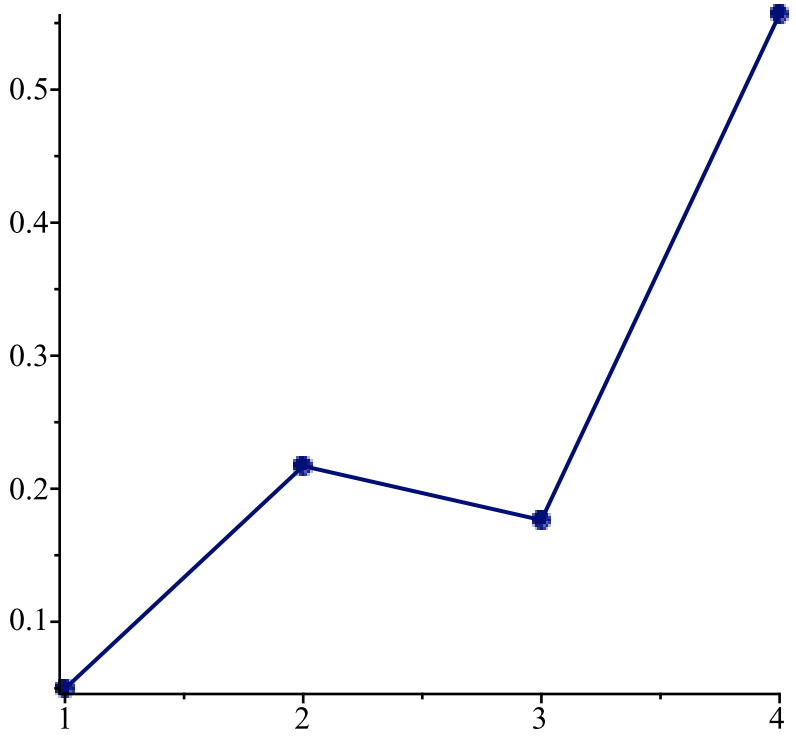
Output P(M18 | A=25)

$nx := 14$



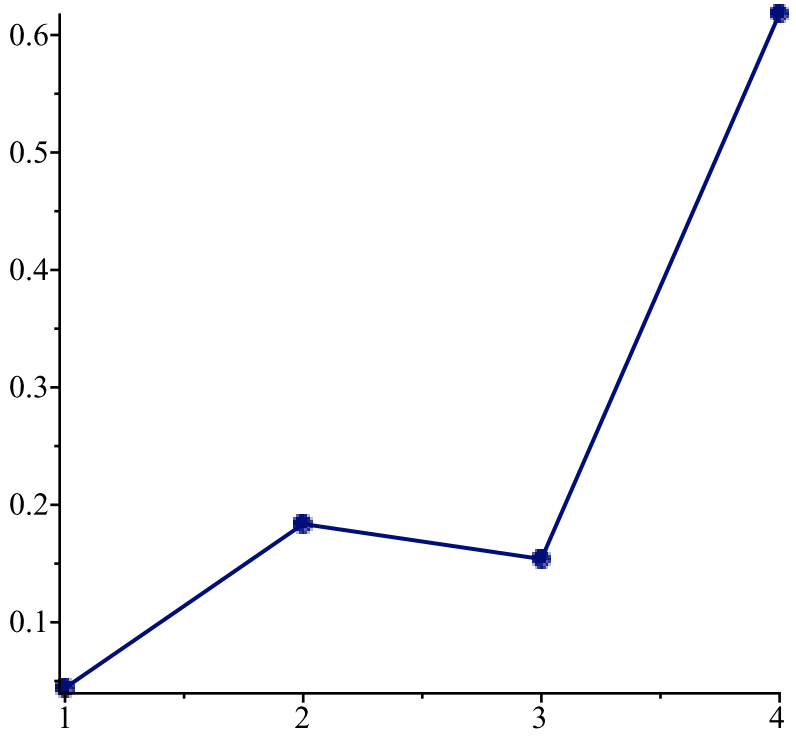
Output P(M18 | A=26)

$nx := 15$



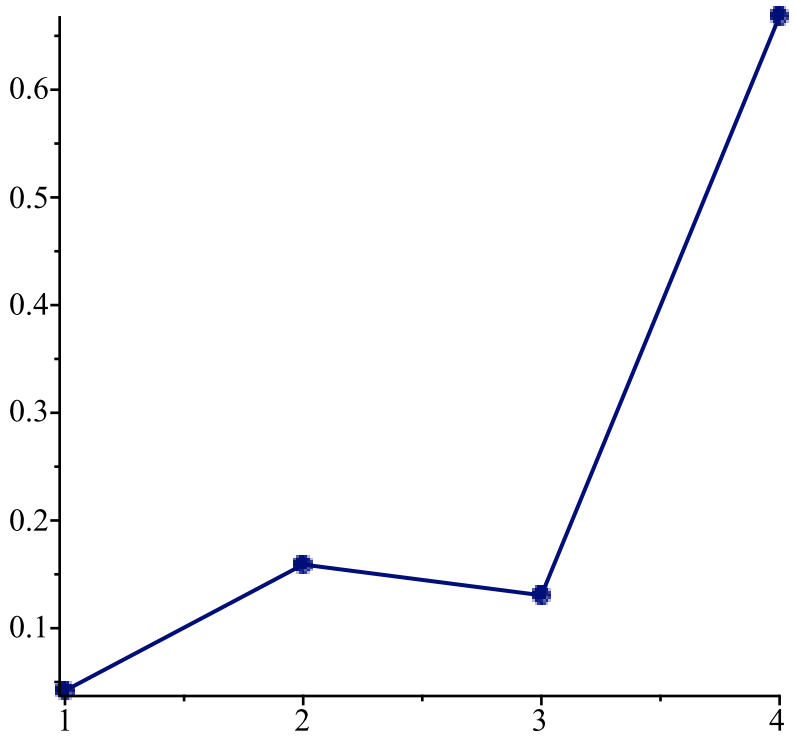
Output P(M18 | A=27)

$nx := 16$



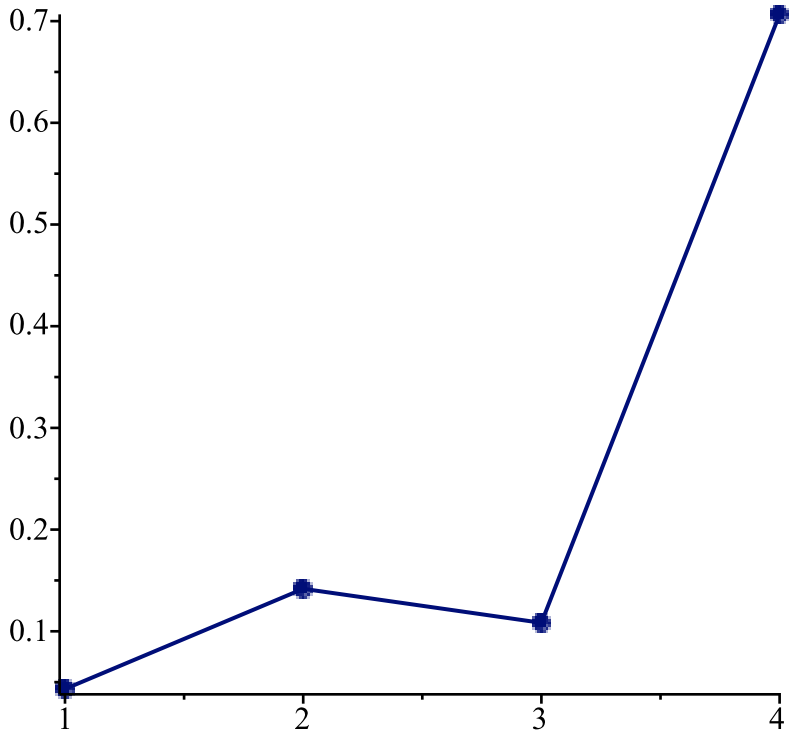
Output P(M18 | A=28)

$nx := 17$



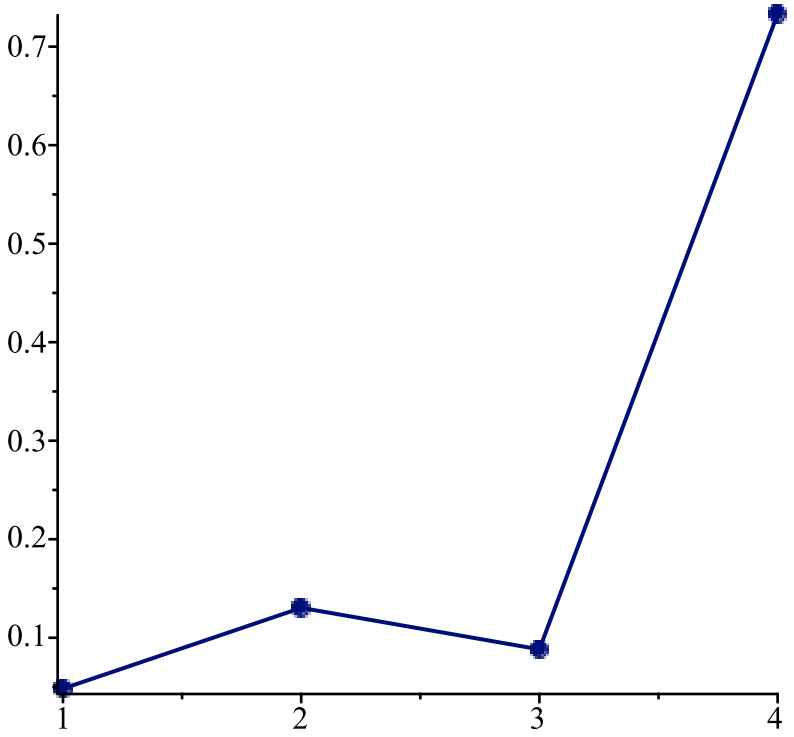
Output P(M18 | A=29)

$nx := 18$



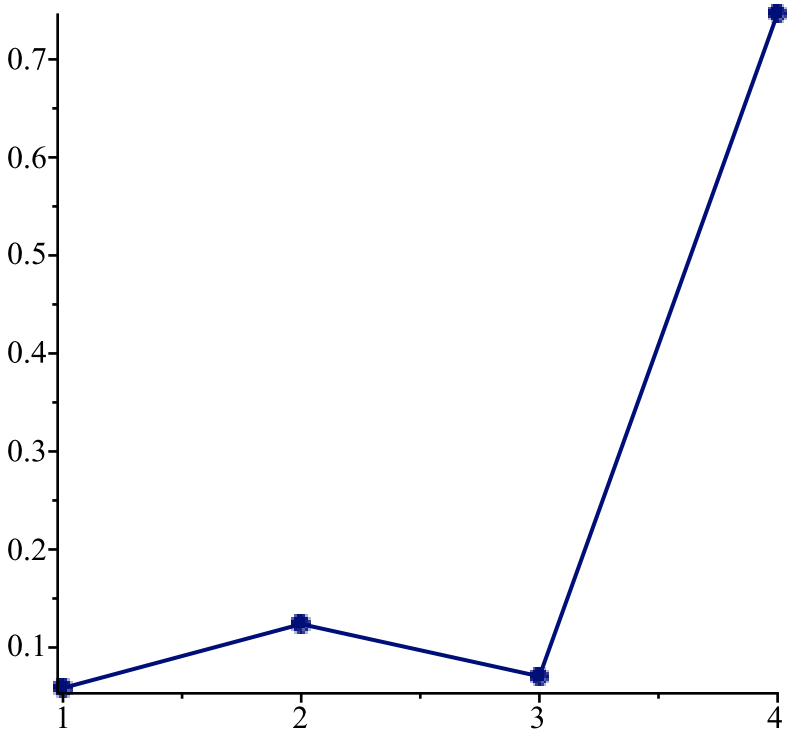
Output P(M18 | A=30)

$nx := 19$



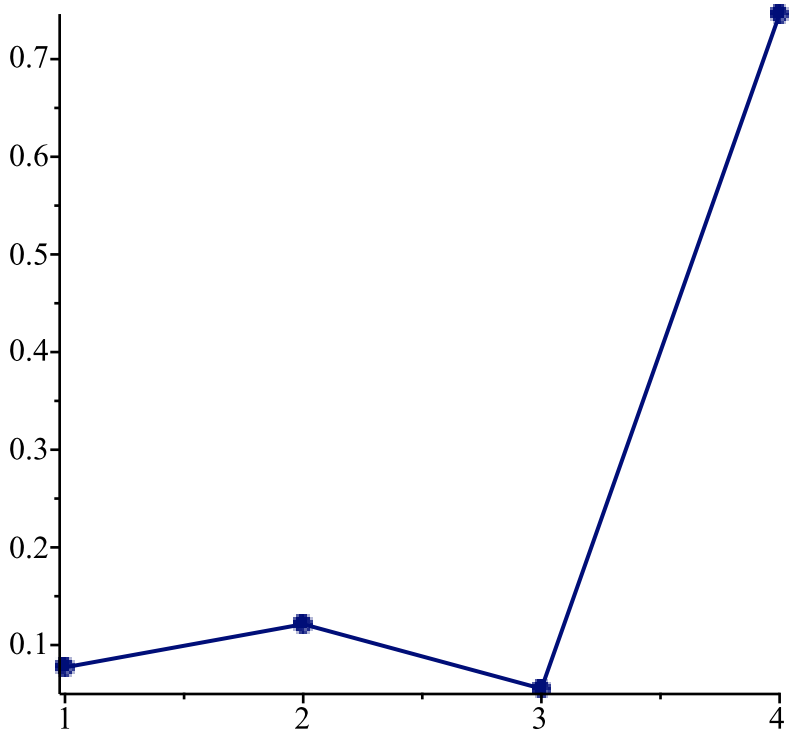
Output P(M18 | A=31)

$nx := 20$



Output P(M18 | A=32)

$nx := 21$



Output P(M18 | A=33)

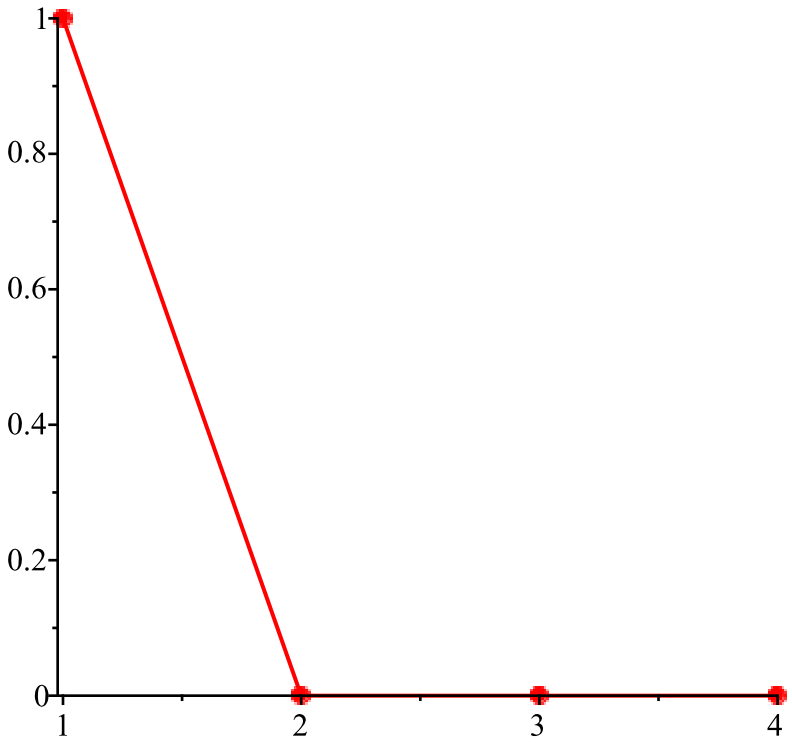
$nx := 22$ **(69)**

for *nx* **from** *1* ***to*** *NA* ***do***

dataplot(*PMA*[*nx*,..], *color* = "red", *caption* = *typeset*("Output P(M2 | A=", *nx* + *AMin*, ")"));

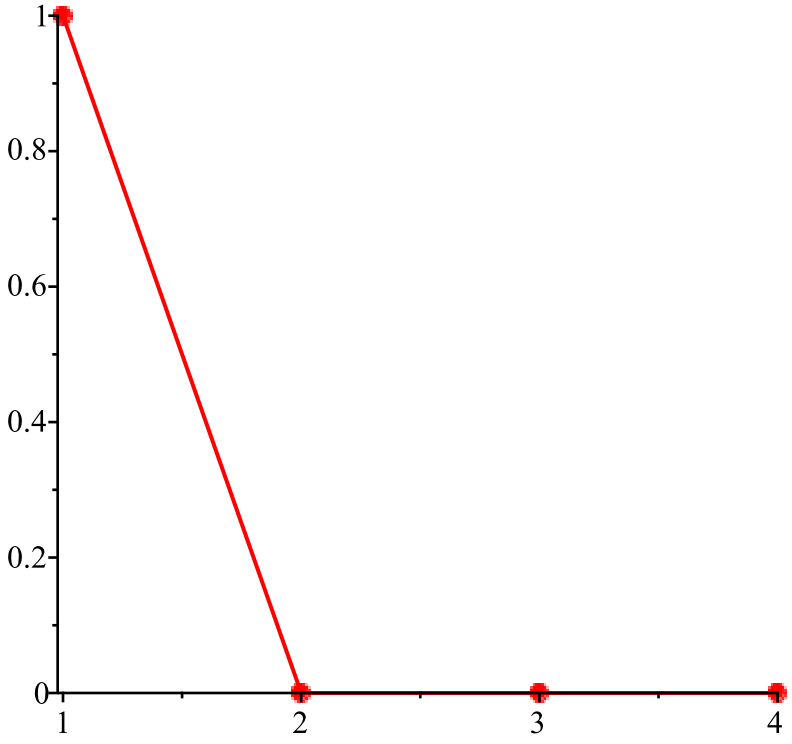
end do;

$nx := 1$



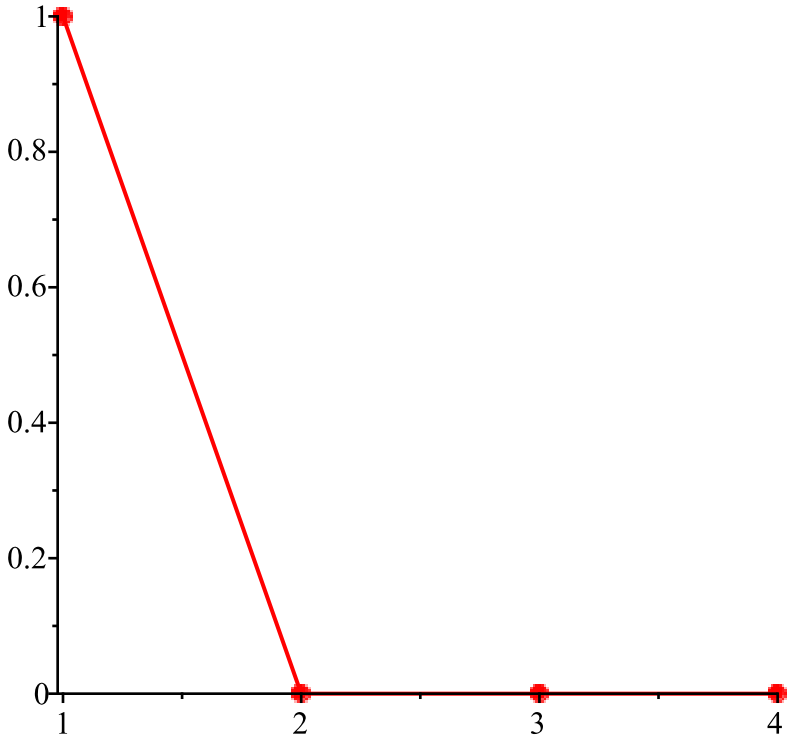
Output P(M2 | A=10)

$nx := 2$



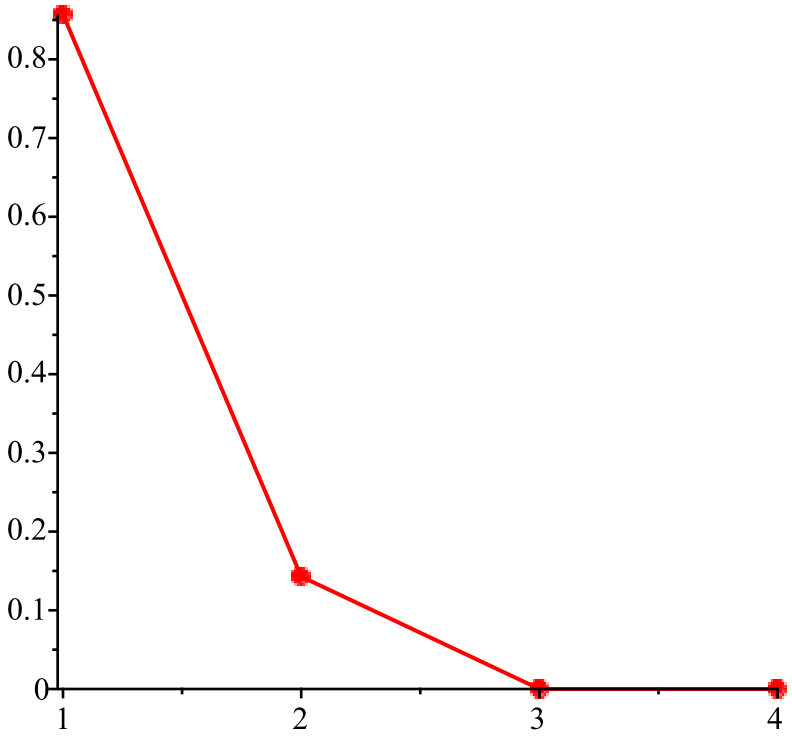
Output P(M2 | A=11)

$nx := 3$



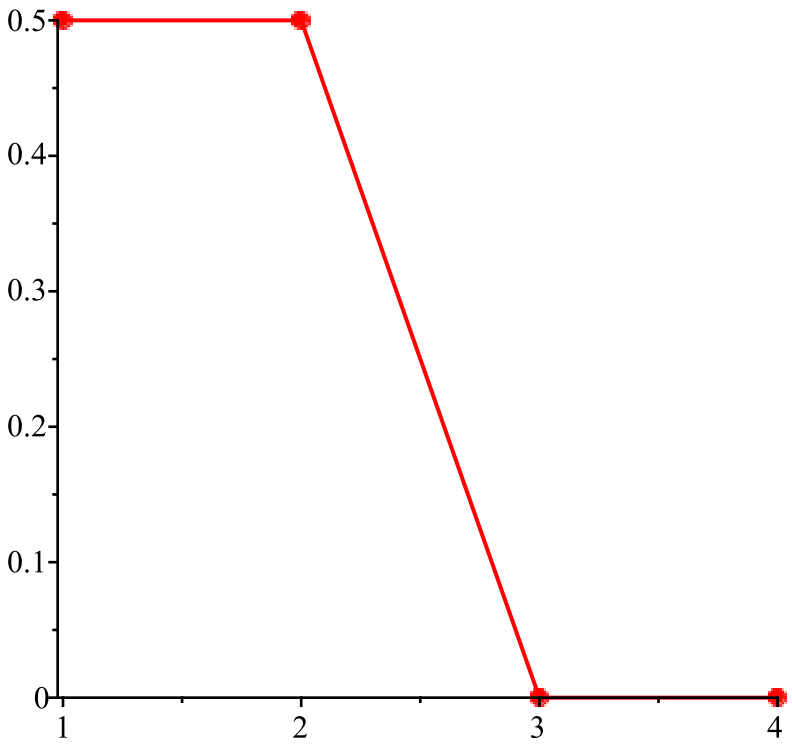
Output P(M2 | A=12)

$nx := 4$



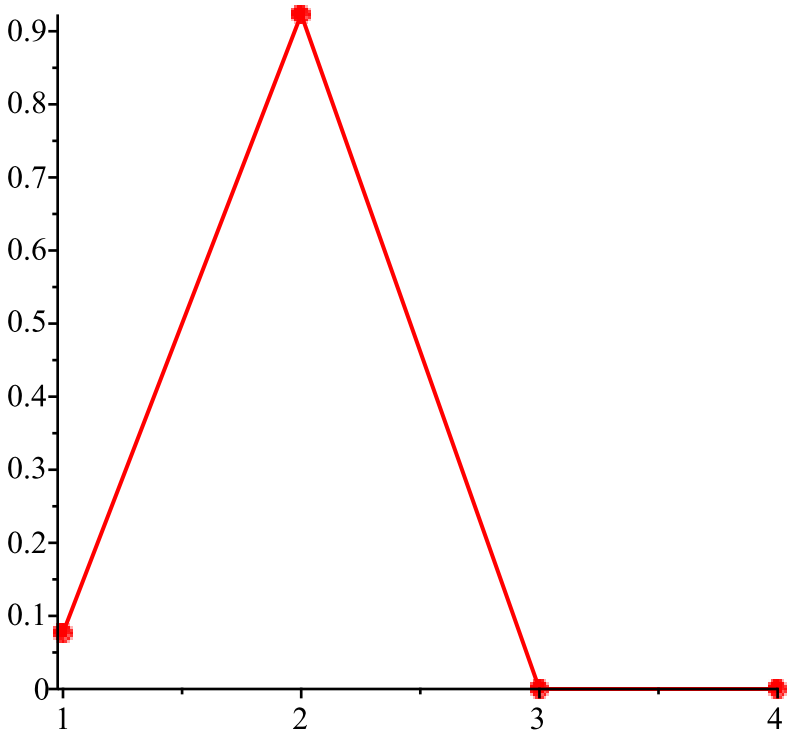
Output P(M2 | A=13)

$nx := 5$



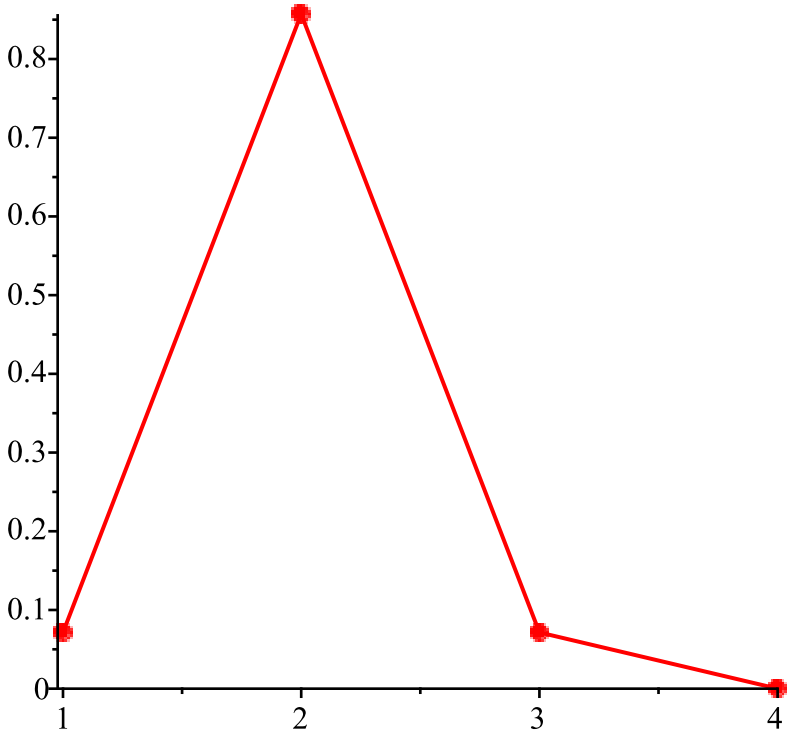
Output P(M2 | A=14)

$nx := 6$



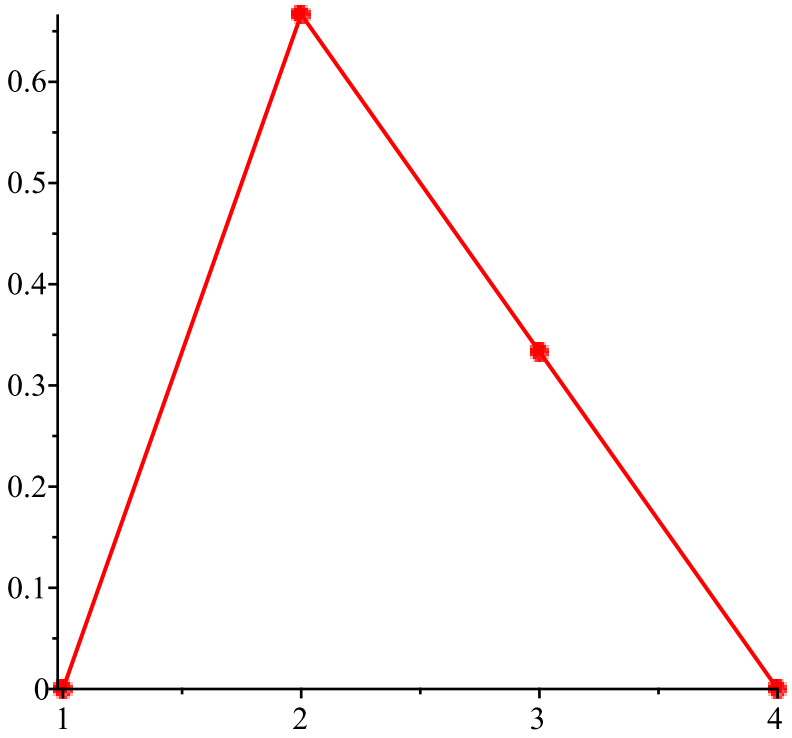
Output P(M2 | A=15)

$nx := 7$



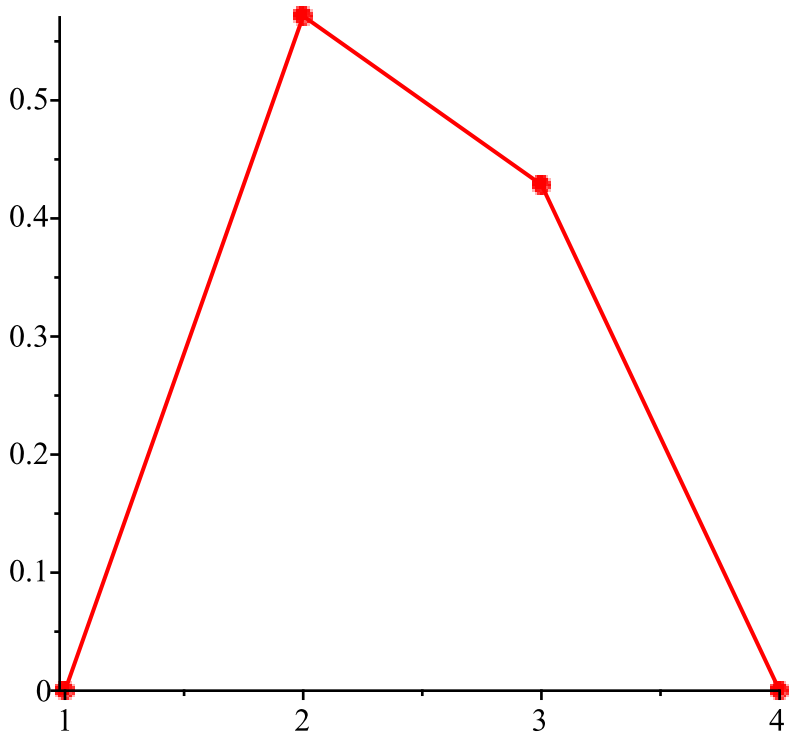
Output P(M2 | A=16)

$nx := 8$



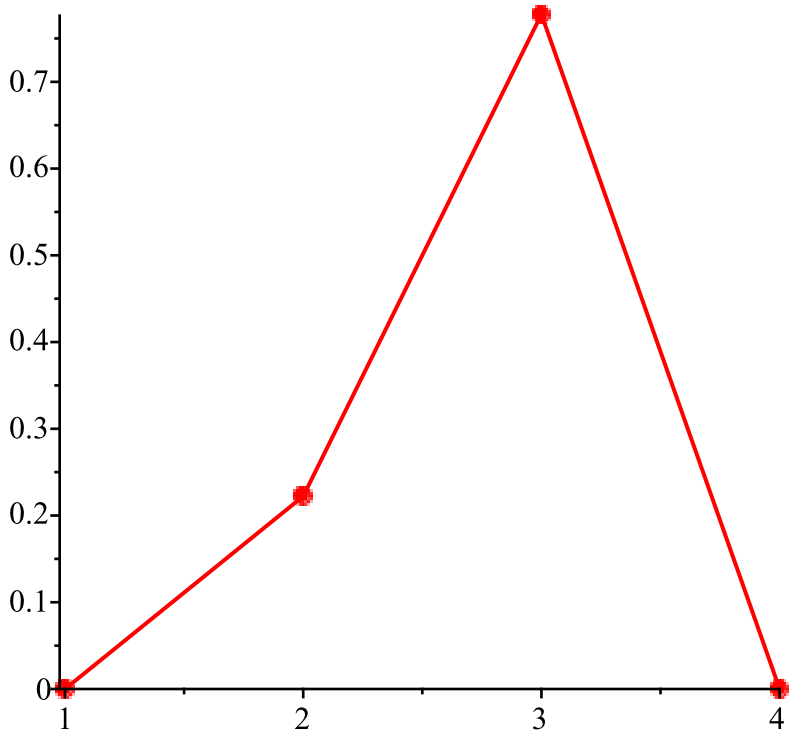
Output P(M2 | A=17)

$nx := 9$



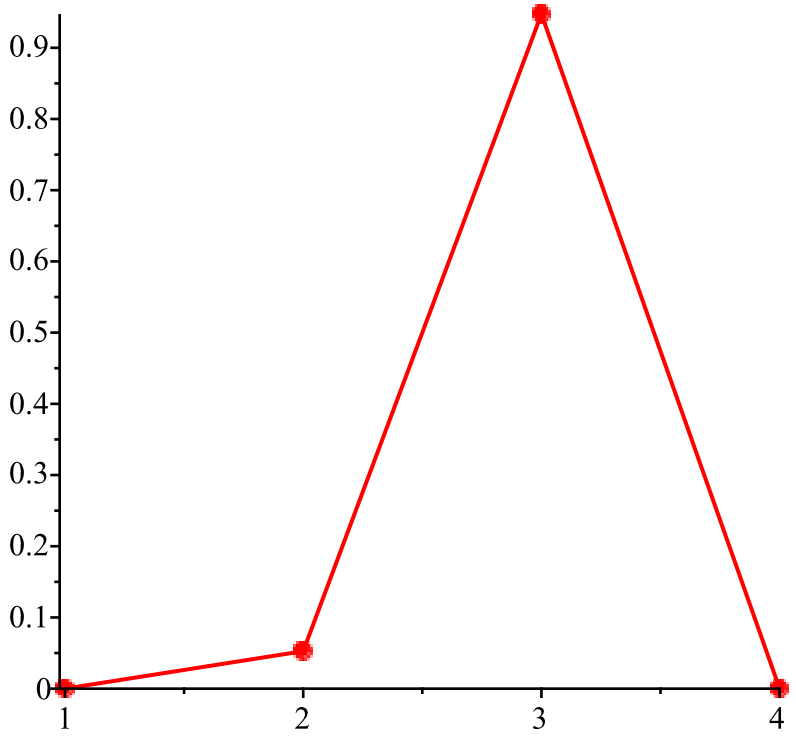
Output P(M2 | A=18)

$nx := 10$



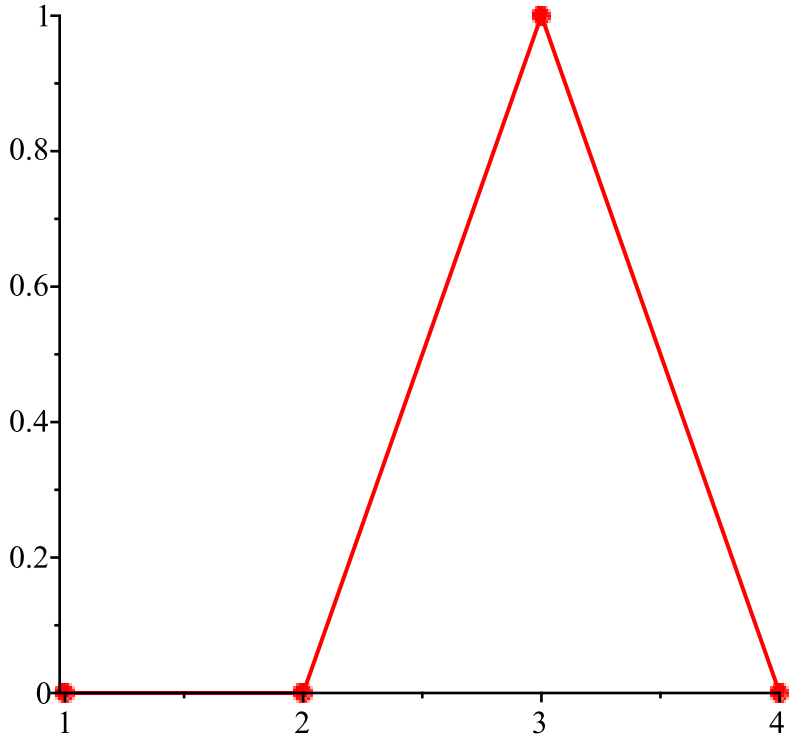
Output P(M2 | A=19)

$nx := 11$



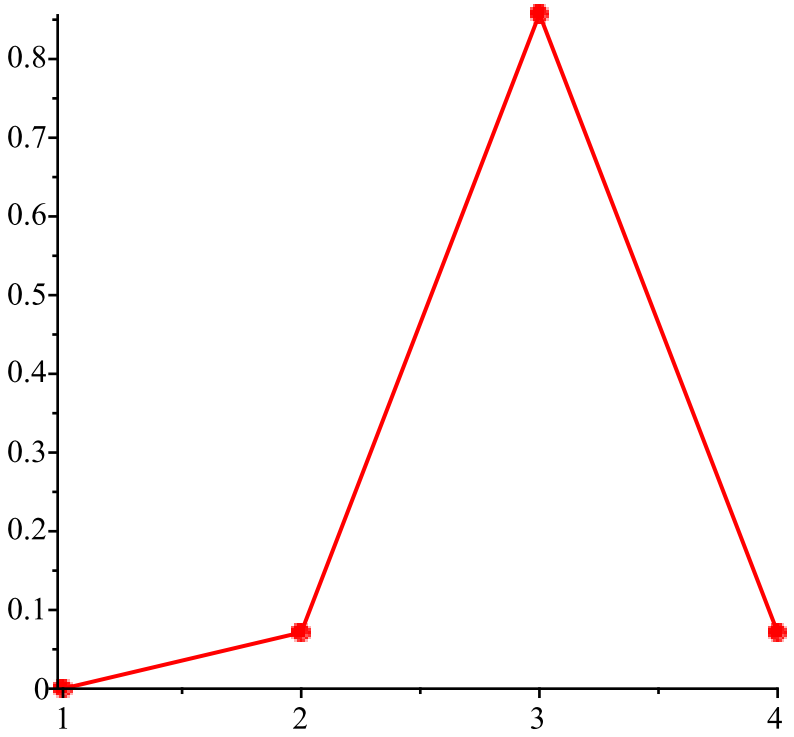
Output P(M2 | A=20)

$nx := 12$



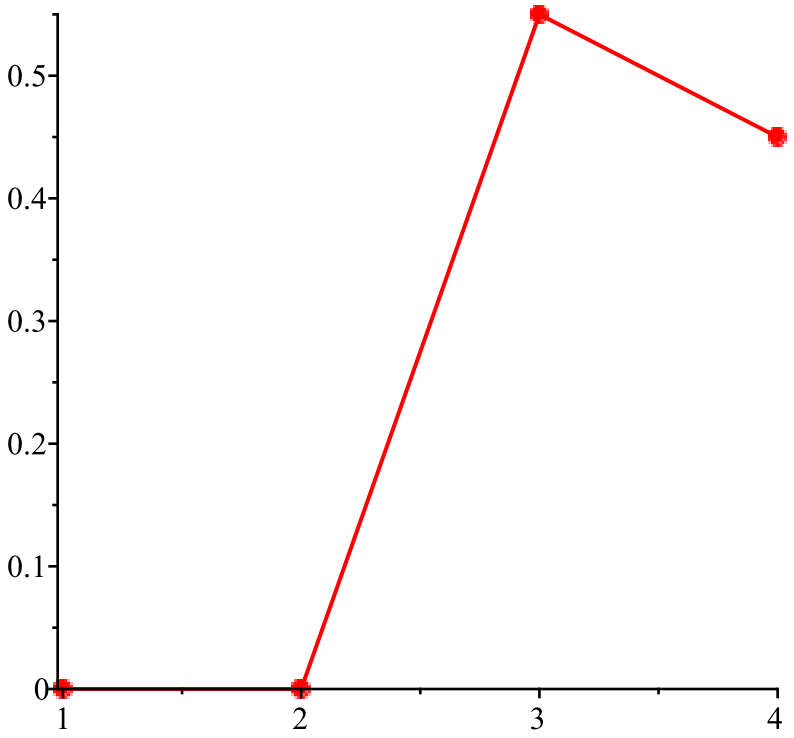
Output P(M2 | A=21)

$nx := 13$



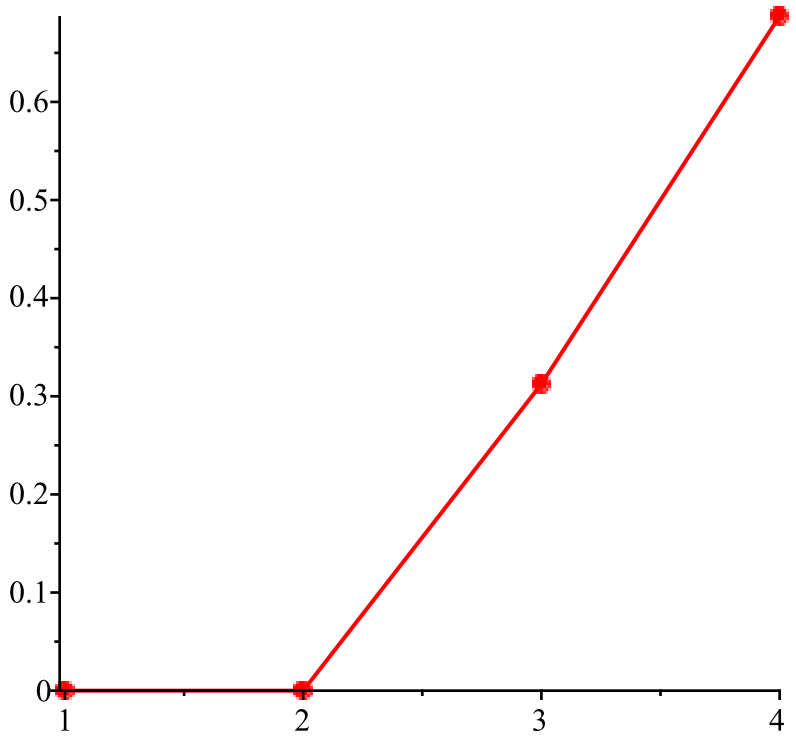
Output P(M2 | A=22)

$nx := 14$



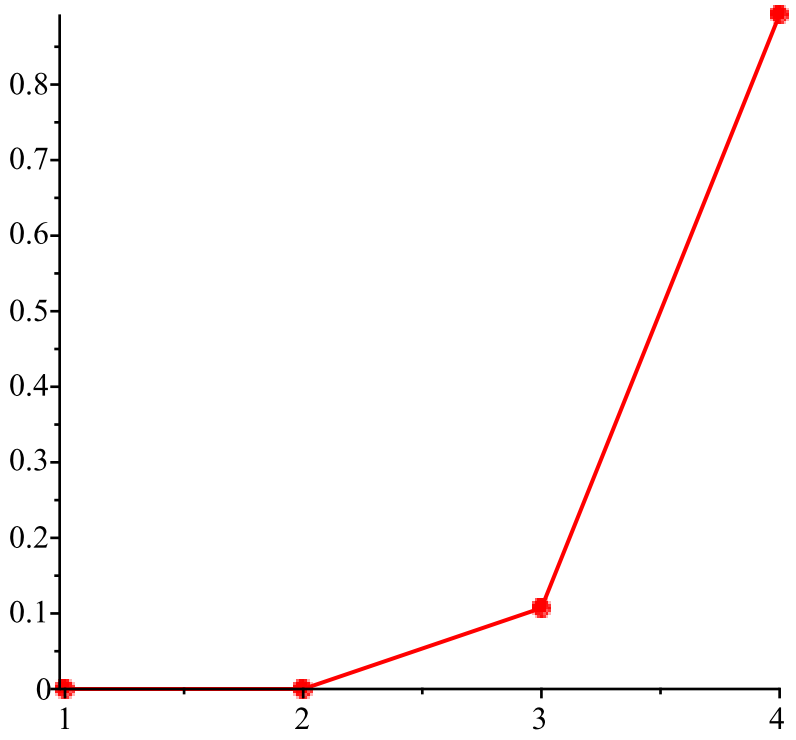
Output P(M2 | A=23)

$nx := 15$



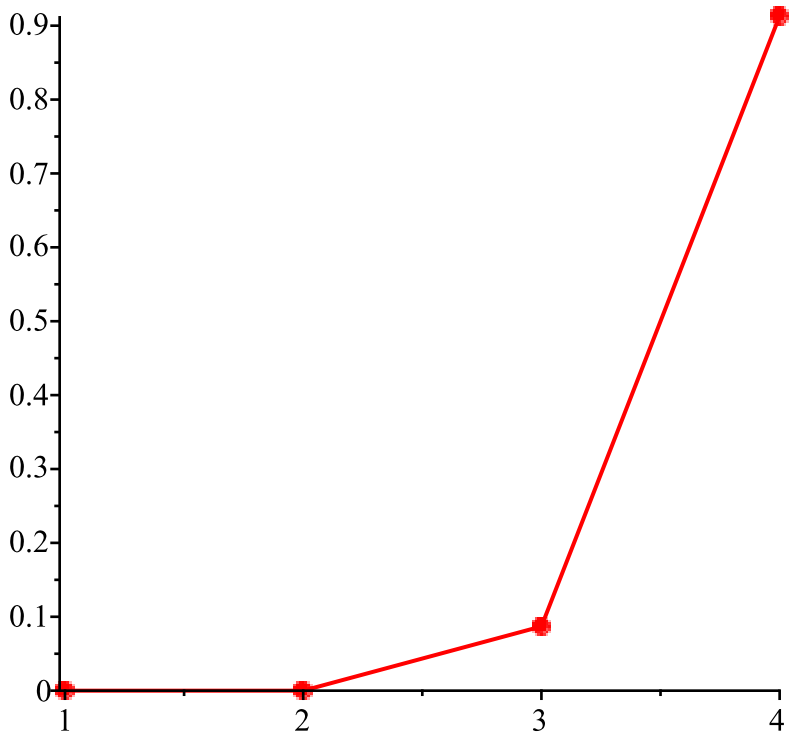
Output P(M2 | A=24)

$nx := 16$



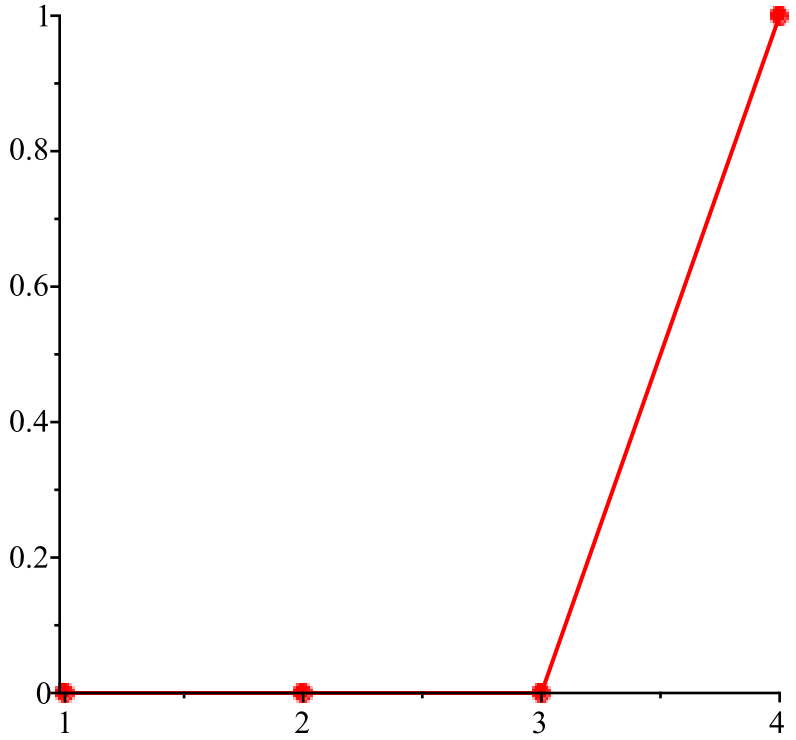
Output P(M2 | A=25)

$nx := 17$



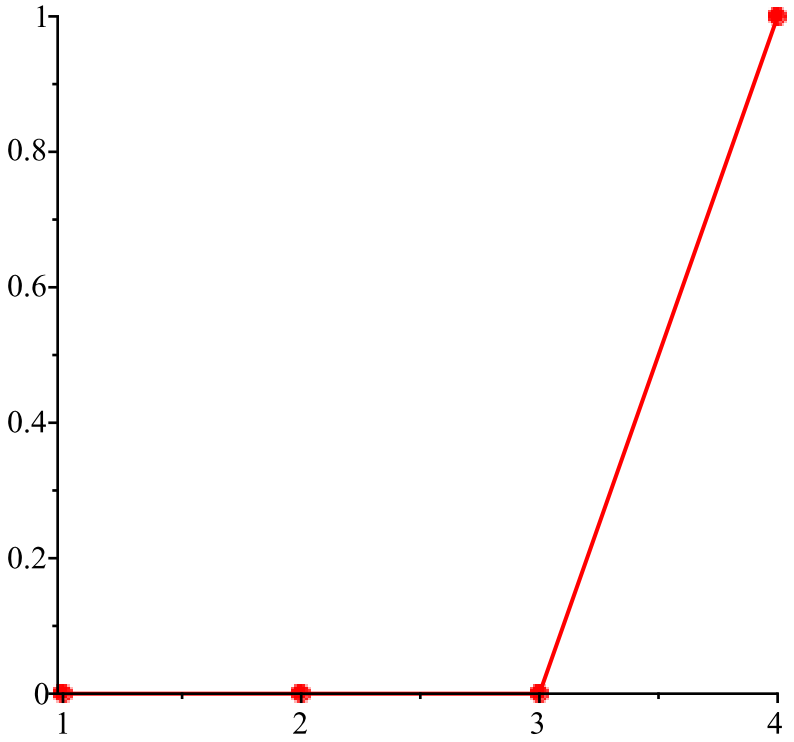
Output P(M2 | A=26)

$nx := 18$



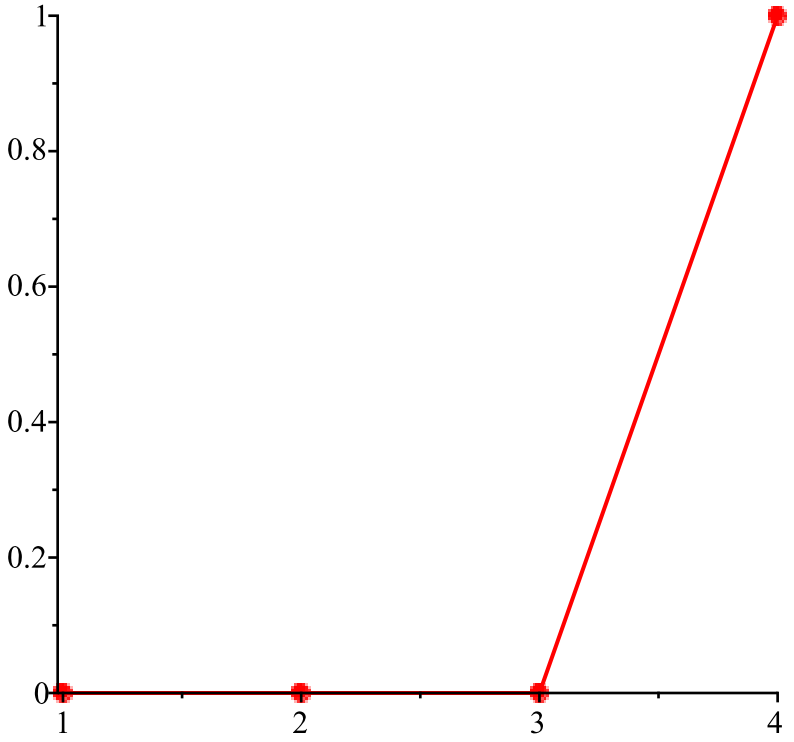
Output P(M2 | A=27)

$nx := 19$



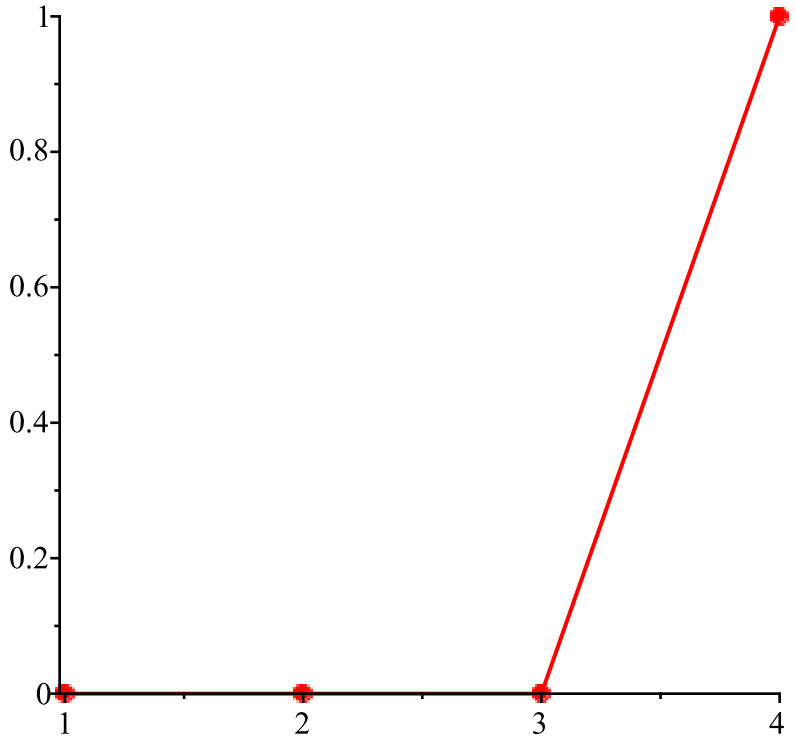
Output P(M2 | A=28)

$nx := 20$



Output P(M2 | A=29)

$nx := 21$



Output P(M2 | A=30)

$nx := 22$ **(70)**

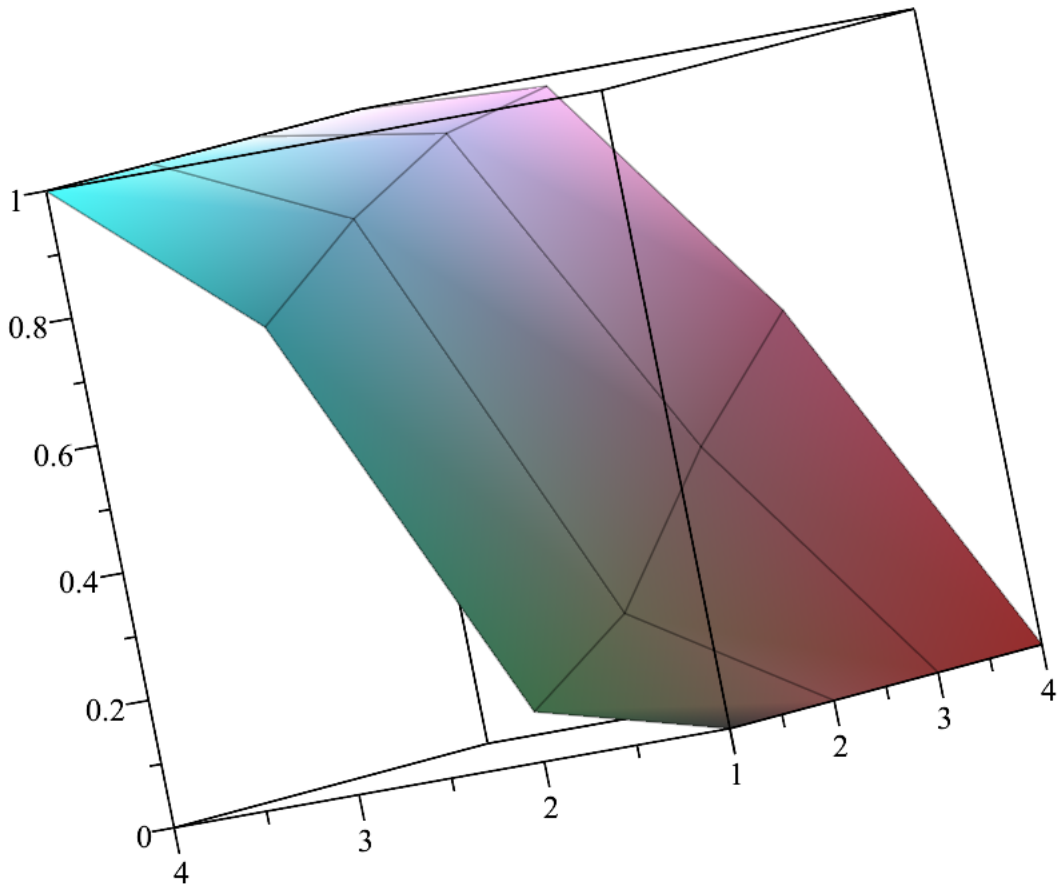
```
# Berechne P(A>=18 | M18 = m1, M2 = m2)
PA18M18M2 := Matrix(NM18, NM2, 0.) :
for ny1 from 1 to NM18 do
    for ny2 from 1 to NM2 do
        for nx from AMin to NA do
            PA18M18M2[ny1, ny2] := PA18M18M2[ny1, ny2] + PAM118M2[nx, NM2·(ny1 − 1)
    + ny2] :
        end do;
    end do:
end do:

#PAM118M2;

PA18M18M2;
```

$$\begin{bmatrix} 0. & 0.0783479464506893 & 0.733837840754400 & 1. \\ 0. & 0.188899639017959 & 0.860471447746264 & 1. \\ 0. & 0.406917851958642 & 0.952150879980468 & 1.00000000000000 \\ 0. & 0.578440776893369 & 0.983651809820881 & 1. \end{bmatrix} \quad \textbf{(71)}$$

```
dataplot([1, 2, 3, 4], [1, 2, 3, 4], PA18M18M2);
```


1
0.8
0.6
0.4
0.2
0
4
3
2
1
1
2
3
4