```
/*  SAS program for a three-way aov.  Data are from    */
/*  Maxwell and Delaney (1990), Designing experiments  */
/*  and analyzing data, Wadsworth, Belmont, CA.        */
/*  Response variable y is blood pressure, treatments  */
/*  are drug (a, b, and c), biofeedback (y, n) and     */
/*  special diet (y, n)                                */
options nocenter ls=72;
data;
  input n1-n12;
  if _n_<4 then biofeed='y';
  else biofeed='n';
  if _n_=1 then drug='a';
  if _n_=4 then drug='a';
  if _n_=2 then drug='b';
  if _n_=5 then drug='b';
  if _n_=3 then drug='c';
  if _n_=6 then drug='c';
  array nall {12} n1-n12;
  do i=1 to 12;
    if i>6 then diet='y';
     else diet='n';
     y=nall{i};
     output;
  end;
  drop i n1-n12;
  cards;
  170 175 165 180 160 158 161 173 157 152 181 190
  186 194 201 215 219 209 164 166 159 182 187 174
  180 187 199 170 204 194 162 184 183 156 180 173
  173 194 197 190 176 198 164 190 169 164 176 175
  189 194 217 206 199 195 171 173 196 199 180 203
  202 228 190 206 224 204 205 199 170 160 179 179
;
proc glm;
  class diet drug biofeed;
  model y=diet|drug|biofeed / ss1 ss2 ss3;
  means diet*drug*biofeed;
  output predicted=yhat residual=res;
proc sort;
  by drug;
```

```
symbol1 v=circle i=none;
proc gplot;
  plot res*yhat;
run;
symbol1 i=join v=none l=2;
symbol2 i=join v=none l=1;
proc gplot;
  by drug;
  plot yhat*biofeed=diet;
run;
```

```
The GLM Procedure

   Class Level Information

Class         Levels    Values

diet               2    n y

drug               3    a b c

biofeed            2    n y


Number of observations    72


Dependent Variable: y

                                       Sum of
Source                     DF        Squares    Mean Square   F Value

Model                      11    13194.00000     1199.45455      7.66

Error                      60     9400.00000      156.66667

Corrected Total            71    22594.00000

Source                 Pr > F

Model                  <.0001

Error

Corrected Total


R-Square     Coeff Var      Root MSE        y Mean

0.583960      6.784095      12.51666      184.5000
```

Source	DF	Type I SS	Mean Square	F Value
diet	1	5202.000000	5202.000000	33.20
drug	2	3675.000000	1837.500000	11.73
diet*drug	2	903.000000	451.500000	2.88
biofeed	1	2048.000000	2048.000000	13.07
diet*biofeed	1	32.000000	32.000000	0.20
drug*biofeed	2	259.000000	129.500000	0.83
diet*drug*biofeed	2	1075.000000	537.500000	3.43

Source	Pr > F
diet	<.0001
drug	<.0001
diet*drug	0.0638
biofeed	0.0006
diet*biofeed	0.6529
drug*biofeed	0.4425
diet*drug*biofeed	0.0388

Source	DF	Type II SS	Mean Square	F Value
diet	1	5202.000000	5202.000000	33.20
drug	2	3675.000000	1837.500000	11.73
diet*drug	2	903.000000	451.500000	2.88
biofeed	1	2048.000000	2048.000000	13.07
diet*biofeed	1	32.000000	32.000000	0.20
drug*biofeed	2	259.000000	129.500000	0.83
diet*drug*biofeed	2	1075.000000	537.500000	3.43

Source	Pr > F
diet	<.0001
drug	<.0001
diet*drug	0.0638
biofeed	0.0006
diet*biofeed	0.6529
drug*biofeed	0.4425
diet*drug*biofeed	0.0388

Source	DF	Type III SS	Mean Square	F Value
diet	1	5202.000000	5202.000000	33.20
drug	2	3675.000000	1837.500000	11.73
diet*drug	2	903.000000	451.500000	2.88
biofeed	1	2048.000000	2048.000000	13.07
diet*biofeed	1	32.000000	32.000000	0.20
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Source	Pr > F
diet	<.0001
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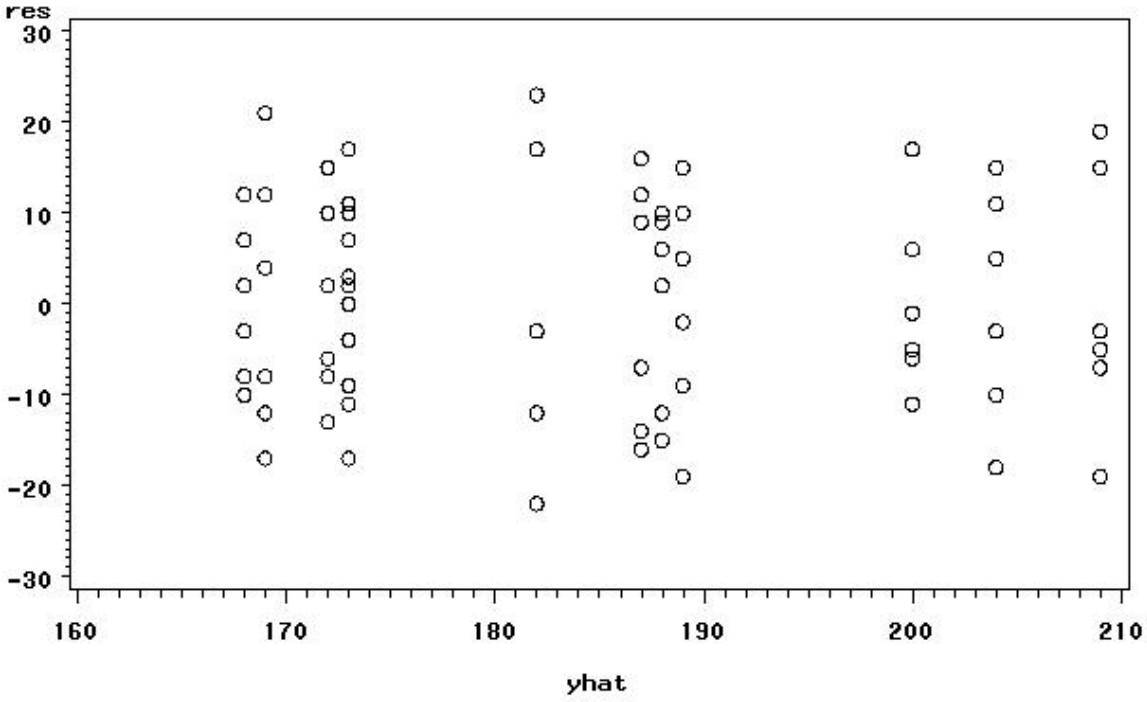
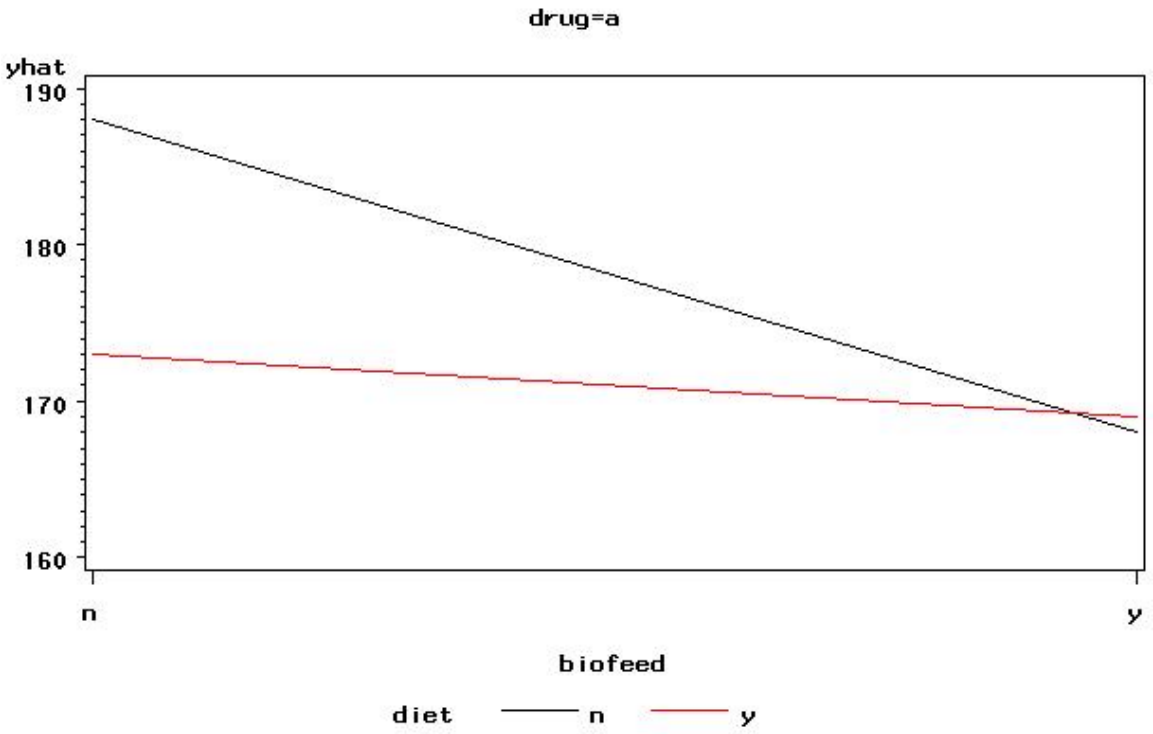
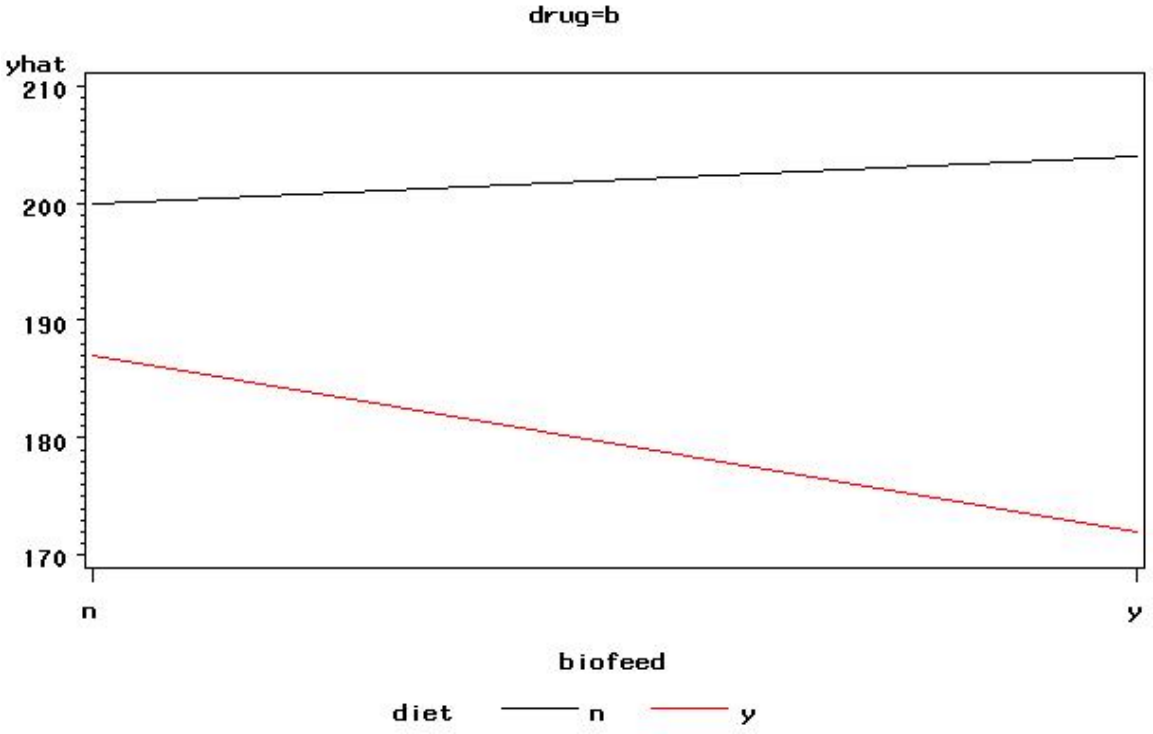
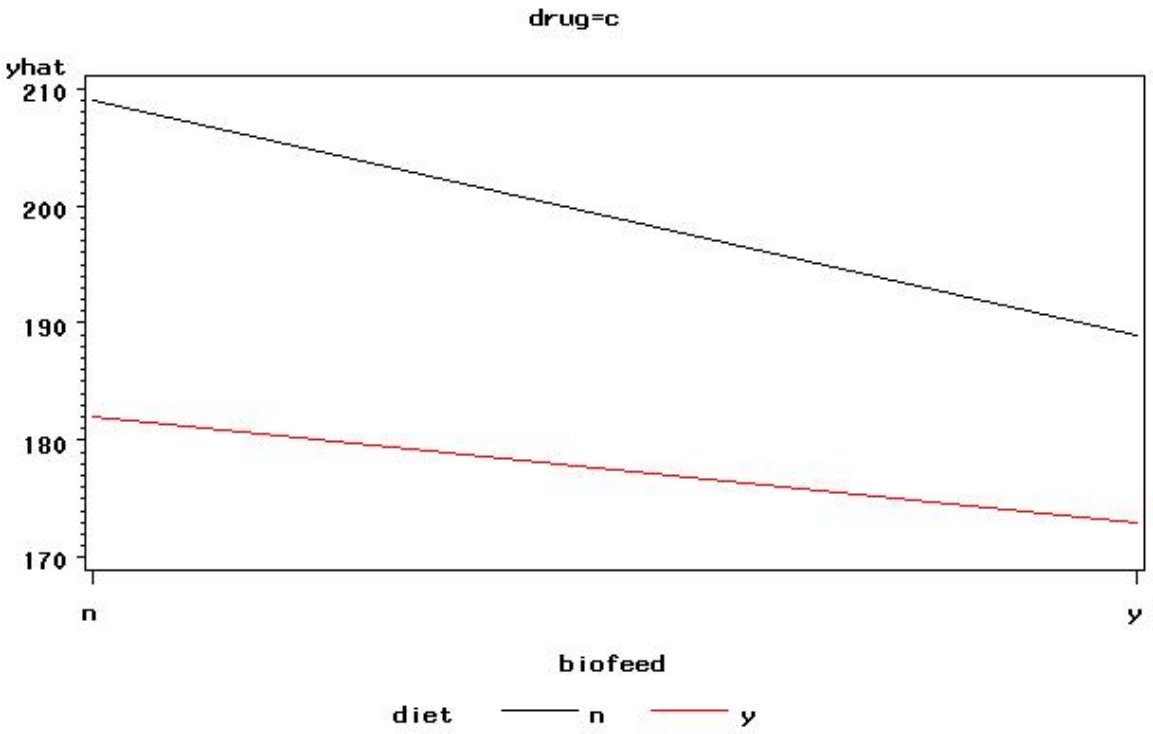
diet*drug	0.0638
biofeed	0.0006
diet*biofeed	0.6529
drug*biofeed	0.4425
diet*drug*biofeed	0.0388

Level of diet	Level of drug	Level of biofeed	N	y Mean	y Std Dev
n	a	n	6	188.000000	10.8627805
n	a	y	6	168.000000	8.6023253
n	b	n	6	200.000000	10.0796825
n	b	y	6	204.000000	12.6806940
n	c	n	6	209.000000	14.3527001
n	c	y	6	189.000000	12.6174482
y	a	n	6	173.000000	9.7979590
y	a	y	6	169.000000	14.8189068
y	b	n	6	187.000000	14.0142784
y	b	y	6	172.000000	10.9361785
y	c	n	6	182.000000	17.1113997
y	c	y	6	173.000000	11.6619038


res
30
20
10
0
-10
-20
-30
160
170
180
190
200
210
yhat


drug=a
yhat
190
180
170
160
n
y
biofeed
diet
n
y


drug=b
yhat
210
200
190
180
170
n
y
biofeed
diet
n
y


drug=c
yhat
210
200
190
180
170
n
y
biofeed
diet
n
y