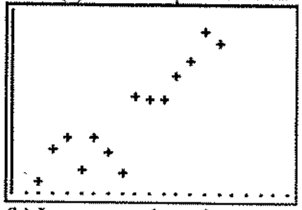
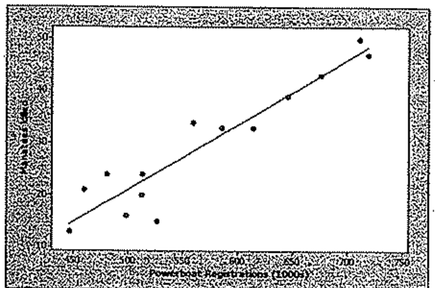
# HW pp 211-214

3.33 (a) A scatterplot from the calculator is shown below.

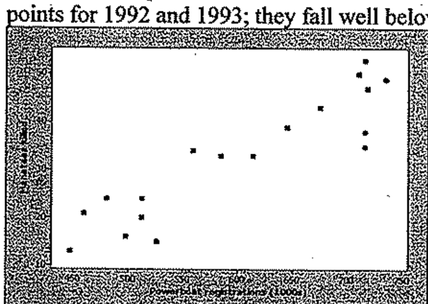


```
WINDOW
 Xmin=1975
 Xmax=1995
 Xscl=1
 Ymin=10
 Ymax=55
 Yscl=.2
 Xres=1
```

(b) Let $y$ = number of manatees killed and $x$ = number of powerboat registrations. The least-square regression equation is $\hat{y} = -41.43 + 0.1249x$.



(c) When 716,000 powerboats are registered, the predicted number of manatees killed will be $-41.43 + 0.1249 \times 716 = 47.99$, or about 48 manatees. (d) Yes, the measures seem to be succeeding, three of the four new points are below the regression line, indicating that fewer manatees than predicted were killed. Additional evidence of success is provided by the two points for 1992 and 1993; they fall well below the overall pattern.



(e) The mean number of manatee deaths for the years with 716,000 powerboat registrations is 42. The prediction of 48 was too high.

3.34 (a) The least squares regression line is $\hat{y} = 31.9 - 0.304x$. The calculator output (and Minitab output) is shown below.

```
LinReg
 y=a+bx
 a=31.93425919
 b=-.3040229451
 r²=.5602033042
 r=-.7484673034
```

**Minitab output**

```
The regression equation is
newadults = 31.9 - 0.304 %returning

Predictor       Coef  SE Coef      T      P
Constant      31.934    4.838   6.60  0.000
%returning  -0.30402  0.08122  -3.74  0.003

S = 3.66689   R-Sq = 56.0%   R-Sq(adj) = 52.0%
```

(b) The means, standard deviations, and correlation are: $\bar{x} = 58.23\%$, $s_x = 13.03\%$, $\bar{y} = 14.23$ new birds, $s_y = 5.29$ new birds, $r = -0.748$. (c) The slope is

$$b = -0.748\left(\frac{5.29}{13.03}\right) \doteq -0.304$$ and the intercept is $a = 14.23 - b \times 58.23 \doteq 31.9$. (d) The slope tells us that as the percent of returning birds increases by one the number of new birds will decrease by $-0.304$ on average. The $y$ intercept provides a prediction that we will see 31.9 new adults in a new colony when the percent of returning birds is zero. This value is clearly outside the range of values studied for the 13 colonies of sparrowhawks and has no practical meaning in this situation. (e) The predicted value for the number of new adults is $31.9 - 0.304 \times 60 = 13.69$ or about 14.

3.35 (a) Let $y$ = Blood Alcohol Content (BAC) and $x$ = Number of Beers. The least-squares regression line is $\hat{y} = -0.0127 + 0.017964x$. (b) The slope indicates that on average, the BAC will increase by 0.017964 for each additional beer consumed. The intercept suggests that the average BAC will be −0.01270 if no beers are consumed; this is clearly ridiculous. (c) The predicted BAC for a student who consumed 6 beers is $-0.0127 + 0.017964 \times 6 = 0.0951$. (d) The prediction error is $0.10 - 0.0951 = 0.0049$.

3.37 The slope is $b = 0.894\left(\frac{0.044139929}{2.1975365}\right) \doteq 0.018$ and the intercept is $a = 0.07375 - b \times 4.8125 \doteq -0.0129$, which is the same as the equation in Exercise 3.35.

3.38 (a) Let $y$ = gas used and $x$ = degree-days. The least-squares regression line is $\hat{y} = 1.08921 + 0.188999x$. (b) The slope tells us that on average the amount of gas used increases by 0.188999 for each one unit increase in degree-days. The $y$ intercept provides a realistic estimate (108.921 cubic feet) for the average amount of gas used when the average number of heating degree-days per day is zero. (c) The predicted value is $1.08921 + 0.188999 \times 20 = 4.8629$, which is very close to the rough estimate of 5 from Exercise 3.36 (b). (d) The predicted value for this month is $1.08921 + 0.188999 \times 30 = 6.7592$, so the prediction error is $640 - 675.92 = -35.92$.