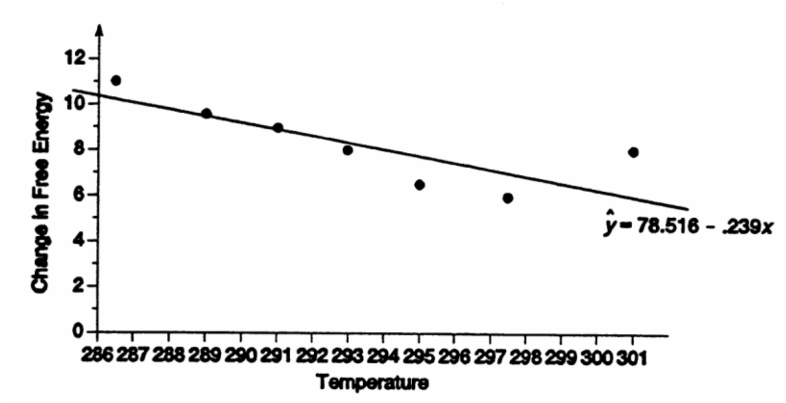
10.32 a.



b. Some preliminary calculations are:

$$\sum x = 2{,}053 \qquad \sum x^2 = 602{,}265.5$$

$$\sum y = 59.2 \qquad \sum y^2 = 517.22 \qquad \sum xy = 17{,}326.7$$

$$SS_{xx} = \sum x^2 - \frac{\left(\sum x\right)^2}{n} = 602{,}265.5 - \frac{(2{,}053)^2}{7} = 149.92857$$

$$SS_{xy} = \sum xy - \frac{\sum x \sum y}{n} = 17{,}326.7 - \frac{(2{,}053)(59.2)}{7} = -35.814286$$

$$\bar{x} = \frac{\sum x}{n} = \frac{2{,}053}{7} = 293.28571 \qquad \bar{y} = \frac{\sum y}{n} = \frac{59.2}{7} = 8.4571429$$

$$\hat{\beta}_1 = \frac{SS_{xy}}{SS_{xx}} = \frac{-35.814286}{149.92857} = -.2388757 \approx -.239$$

$$\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x} = 78.516$$

The least squares line is $\hat{y} = 78.516 - .239x$

c. The least squares line is plotted on the graph above.

d. To determine if temperature is a useful linear predictor of change in free energy, we test:

$$H_0\text{: } \beta_1 = 0$$
$$H_a\text{: } \beta_1 \neq 0$$

The test statistic is $t = \dfrac{\hat{\beta}_1 - 0}{s/\sqrt{SS_{xx}}} = \dfrac{-.239 - 0}{1.265/\sqrt{149.9286}} = -2.31$

The rejection region requires $\alpha/2 = .01/2 = .005$ in both tails of the t distribution with df $= n - 2 = 7 - 2 = 5$. From Table 7, Appendix B, $t_{.005} = 4.032$. The rejection region is $t > 4.032$ or $t < -4.032$.

Since the observed value of the test statistic does not fall in the rejection region ($t = -2.31 \nless -4.032$), H_0 is not rejected. There is insufficient evidence to indicate that temperature is a useful linear predictor of change in free energy.

e. It looks like observation #5 is an outlier.

f. Refitting the data yields a least squares line of $\hat{y} = 139.759 - .4996x$.