1.

Explain why you would or wouldn't agree with each of the following statements:

(a) $\text{Cov}(Y, X)$ and $\text{Cor}(Y, X)$ can take values between $-\infty$ and $+\infty$.

(b) If $\text{Cov}(Y, X) = 0$ or $\text{Cor}(Y, X) = 0$, one can conclude that there is no relationship between $Y$ and $X$.

(c) The least squares line fitted to the points in the scatter plot of $Y$ versus $\hat{Y}$ has a zero intercept and a unit slope.

2.

When fitting a simple linear regression model $Y = \beta_0 + \beta_1 X + \varepsilon$ to a set of data using the least squares method, suppose that $H_0 : \beta_1 = 0$ was not

rejected. This implies that the model can be written simply as: $Y = \beta_0 + \varepsilon$. The least squares estimate of $\beta_0$ is $\hat{\beta}_0 = \bar{y}$. (Can you prove that?)

(a) What are the ordinary least squares residuals in this case?

(b) Show that the ordinary least squares residuals sum up to zero.

3.

**Table 2.9** Regression Output for Computer Repair Data

| Variable | Coefficient | s.e. | $t$-Test | $p$-value |
|---|---|---|---|---|
| Constant | 4.162 | 3.355 | 1.24 | 0.2385 |
| Units | 15.509 | 0.505 | 30.71 | $< 0.0001$ |

1)

Using the regression output in Table 2.9, test the following hypotheses using $\alpha = 0.1$:

(a) $H_0 : \beta_1 = 15$ versus $H_1 : \beta_1 \neq 15$

(b) $H_0 : \beta_1 = 15$ versus $H_1 : \beta_1 > 15$

(c) $H_0 : \beta_0 = 0$ versus $H_1 : \beta_0 \neq 0$

(d) $H_0 : \beta_0 = 5$ versus $H_1 : \beta_0 \neq 5$

2)

Using the regression output in Table 2.9, construct the 99% confidence interval for $\beta_0$.