7. $r^2 = 0.629$. 62.9% of the variation in highway fuel consumption is explained by the linear correlation between weight and highway fuel consumption, and 37.1% of the variation in highway fuel consumption is explained by other factors and/or random variation.
9. $r = 0.842$. Critical values: $r = \pm 0.312$ (assuming a 0.05 significance level). P-value $= 0.000$. There is sufficient evidence to support a claim of a linear correlation between foot length and height.
11. 189 cm
13. 160 cm $< y <$ 183 cm
15. 149 cm $< y <$ 168 cm
17. a. 10,626.59 b. 68.83577 c. 38.0°F $< y <$ 60.4°F
19. a. 0.466276 b. 0.000007359976
c. 0.168 billion light-years $< y <$ 0.176 billion light-years
21. $58.9 < \beta_0 < 103$; $2.46 < \beta_1 < 3.98$

Section 10-5

1. The response variable is weight and the predictor variables are length and chest size.
3. The unadjusted R^2 increases (or remains the same) as more variables are included, but the adjusted R^2 is adjusted for the number of variables and sample size. The unadjusted R^2 incorrectly suggests that the best multiple regression equation is obtained by including all of the available variables, but by taking into account the sample size and number of predictor variables, the adjusted R^2 is much more helpful in weeding out variables that should not be included.
5. LDL = 47.4 + 0.085 WT + 0.497 SYS
7. No. The P-value of 0.149 is not very low, and the values of R^2 (0.098) and adjusted R^2 (0.049) are not high. Although the multiple regression equation fits the sample data best, it is not a good fit.
9. HWY (highway fuel consumption) because it has the best combination of small P-value (0.000) and highest adjusted R^2 (0.920).
11. CITY = −3.15 + 0.819 HWY. That equation has a low P-value of 0.000 and its adjusted R^2 value of 0.920 isn't very much less than the values of 0.928 and 0.935 that use two predictor variables, so in this case it is better to use the one predictor variable instead of two.
13. The best regression equation is $\hat{y} = 0.127 + 0.0878x_1 - 0.0250x_2$, where x_1 represents tar and x_2 represents carbon monoxide. It is best because it has the highest adjusted R^2 value of 0.927 and the lowest P-value of 0.000. It is a good regression equation for predicting nicotine content because it has a high value of adjusted R^2 and a low P-value.
15. The best regression equation is $\hat{y} = 109 - 0.00670x_1$, where x_1 represents volume. It is best because it has the highest adjusted R^2 value of −0.0513 and the lowest P-value of 0.791. The three regression equations all have adjusted values of R^2 that are very close to 0, so none of them are good for predicting IQ. It does not appear that people with larger brains have higher IQ scores.
17. For H_0: $\beta_1 = 0$, the test statistic is $t = 5.486$, the P-value is 0.000, and the critical values are $t = \pm 2.110$, so reject H_0 and conclude that the regression coefficient of $b_1 = 0.707$ should be kept. For H_0: $\beta_2 = 0$, the test statistic is $t = 1.292$, the P-value is 0.213, and the critical values are $t = \pm 2.110$, so fail to reject H_0 and conclude that the regression coefficient of $b_2 = 0.164$ should be omitted. It appears that the regression equation should include the height of the mother as a predictor variable, but the height of the father should be omitted.
19. $\hat{y} = 3.06 + 82.4x_1 + 2.91x_2$, where x_1 represents sex and x_2 represents age. Female: 61 lb; male: 144 lb. The sex of the bear does appear to have an effect on its weight. The regression equation indicates that the predicted weight of a male bear is about 82 lb more than the predicted weight of a female bear with other characteristics being the same.

Section 10-6

1. $y = x^2$; quadratic; $R^2 = 1$
3. 10.3% of the variation in Super Bowl points can be explained by the quadratic model that relates the variable of year and the variable of points scored. Because such a small percentage of the variation is explained by the model, the model is not very useful.
5. Quadratic: $d = -4.88t^2 + 0.0214t + 300$
7. Exponential: $y = 100(1.03^x)$
9. Power: $y = 65.7x^{-0.945}$. Prediction for the 22nd day: \$3.5 million, which isn't very close to the actual amount of \$2.2 million. The model does not take into account the fact that movies do better on weekend days.
11. Logarithmic: $y = 3.22 + 0.293 \ln x$
13. Exponential: $y = 10(2^x)$
15. Quadratic: $y = 125x^2 - 439x + 3438$. The projected value for 2010 is 49,344 (Tech: 49,312), which is dramatically greater than the actual value of 11,655.
17. a. Exponential: $y = 2^{\frac{2}{3}(x-1)}$ [or $y = (0.629961)(1.587401)^x$ for an initial value of 1 that doubles every 1.5 years].
b. Exponential: $y = (1.36558)(1.42774)^x$, where 1971 is coded as 1.
c. Moore's law does appear to be working reasonably well. With $R^2 = 0.990$, the model appears to be very good.

Chapter 10: Quick Quiz

1. ± 0.878
2. Based on the critical values of ± 0.878 (assuming a 0.05 significance level), conclude that there is not sufficient evidence to support the claim of a linear correlation between systolic and diastolic readings.
3. The best predicted diastolic reading is 90.6, which is the mean of the five sample diastolic readings.
4. The best predicted diastolic reading is 85.3, which is found by substituting 125 for x in the regression equation.
5. $r^2 = 0.342$
6. False. 7. False. 8. $r = 1$
9. Because r must be between −1 and 1 inclusive, the value of 3.335 is the result of an error in the calculations.
10. $r = -1$

Chapter 10: Review Exercises

1. a. $r = 0.926$. Critical values: $r = \pm 0.707$ (assuming a 0.05 significance level). P-value $= 0.001$. There is sufficient evidence to support the claim that there is a linear correlation between duration and interval-after time.
b. 85.7% c. $\hat{y} = 34.8 + 0.234x$ d. 81.6 min