Name: _____

2.3 – LINEAR REGRESSION

Past due on: _____ Period: _____

UNLESS OTHERWISE STATED, ROUND THE VALUES TO TWO DECIMAL PLACES.

1. The table shows the growth in the consumer price index (CPI) for housing for selected years between 1980 and 2003 (based on 1983 dollars).

   a. Find a linear regression model that shows the CPI for housing, H, as a function of the <u>years since 1980</u>, x.

   b. What is the correlation coefficient?

   c. Use the model to predict the CPI for housing in 2010. Is this interpolation or extrapolation?

Computer Price Index (Housing)	
Year	Housing CPI
1980	81.1
1985	107.7
1990	128.5
1995	148.5
1998	160.4
1999	163.9
2000	169.6
2001	176.4
2002	180.3
2003	184.8

Source: Bureau of Labor Statistics, quoted in The World Almanac and Book of Facts 2005.

   d. What is the slope? What is the meaning of the slope in terms of the problem's context?

2. Table 2.2 shows the demand (in boxes sold each week) of a store-brand doughnut-shaped oat breakfast cereal as a function of the price per box.

   a. Find a linear regression model that shows the boxes sold, B, as a function of the price per box, p. (Round values to the nearest whole number.)

   b. What is the correlation coefficient?

   c. Use the model to predict the weekly cereal sales if the price is dropped to $2.00 per box. Is this interpolation or extrapolation?

Table 2.2 Weekly Sales Data Based on Marketing Research	
Price per box	Boxes sold
$2.40	38,320
$2.60	33,710
$2.80	28,280
$3.00	26,550
$3.20	25,530
$3.40	22,170
$3.60	18,260

   d. Use the model to predict the weekly cereal sales if the price is raised to $4.00 per box. Is this interpolation or extrapolation?

   e. What is the vertical intercept? What is the meaning of the vertical intercept in terms of the problem's context?

3. Table 2.6 shows the average hourly compensation of production workers in manufacturing for several years.

Table 2.6 Production Worker Average	
Year	Hourly Compensation (dollars)
1975	6.36
1985	13.01
1995	17.19
2002	21.37

Source: U.S. Bureau of Labor Statistics as reported in The World Almanac and Book of Facts, 2005.

   a. Find a linear regression model that shows the hourly compensation, C, as a function of the years since 1970, x.

   b. What is the correlation coefficient?

   c. Use the model to predict the production worker average hourly compensation in the year 2000. Is this interpolation or extrapolation?

   d. What is the slope? What is the meaning of the slope in terms of the problem's context?

   e. What is the vertical intercept? What is the meaning of the vertical intercept in terms of the problem's context?

4. Table 2.9 shows the median U.S. family income for selected years.

Table 2.9 Median Family Income in the U.S. (in 2003 dollars)	
Year	Median Family Income ($)
1947	21,201
1973	43,219
1979	45,989
1989	49,014
1995	48.679
2000	54,191
2003	52,680

Source: Economic Policy Institute, The State of Working America 2004/2005 (ILR Press, 2005).

   a. Find a linear regression model that shows the median family income, I, as a function of the years since 1940, x.

   b. What is the correlation coefficient?

   c. Use the model to predict the median U.S. family income in 2010.

   d. In what year was the median family income $32,000?

   e. What is the slope? What is the meaning of the slope in terms of the problem's context?

   f. What is the vertical intercept? What is the meaning of the vertical intercept in terms of the problem's context?

Chapter 2: Linear Functions

5. Table 1.15 shows the imports of crude oil to the U.S. from Canada in the years 1995 – 2004 (in thousands of barrels per day).

   a. Find a linear regression model that shows the crude oil imports, I, as a function of the years since 1990, x.

   b. What is the correlation coefficient?

   c. Use the model to predict the number of barrels in 2010.

Table 1.15 Crude Oil Imports from Canada	
Year	Barrels/day × 1000
1995	1,040
1996	1,075
1997	1,198
1998	1,266
1999	1,178
2000	1,348
2001	1,356
2002	1,445
2003	1,549
2004	1,606

   d. What is the slope? What is the meaning of the slope in terms of the problem's context?

   e. What is the vertical intercept? What is the meaning of the vertical intercept in terms of the problem's context?

6. Table 1.13 shows the average hourly earnings of U.S. production workers for 1990 – 2003.

   a. Find a linear regression model that shows the average hourly earnings, E, as a function of the years since 1990, x.

   b. What is the correlation coefficient?

   c. Use the model to predict the average hourly earnings in 2010.

   d. What is the slope? What is the meaning of the slope in terms of the problem's context?

Table 1.13 Average Hourly Earnings	
Year	Average Hourly Earnings
1990	10.19
1991	10.50
1992	10.76
1993	11.03
1994	11.32
1995	11.64
1996	12.03
1997	12.49
1998	13.00
1999	13.47
2000	14.00
2001	14.53
2002	14.95
2003	15.35

Source: Bureau of Labor Statistics, U.S. Dept. of Labor, as reported in The World Almanac and Book of Facts 2005.