MA 097 and MA 115A - Linear Functions Review Problems
Rockville Campus – Revised Fall 2012

1. The value of a certain type of automobile depreciates linearly. In 2000 the value was $15,600 and in 2005 the value was $9100. Use the slope formula to determine the average rate of change of the value of the car. Write your result in a complete sentence with correct units.

2. The percentages of Americans living below the poverty level are shown in the table.
    a) Create a scattergram of the given data AND draw a line passing through the starred (*) data points. b) Use the slope formula and the two starred (*) points above to determine the slope of the line. Give your answer as a decimal. Write the meaning of your result from part b in a complete sentence with correct units.

Percentages of Americans Living Below the Poverty Level	
Year	Percent
*1996	13.7
1997	13.3
1998	12.7
1999	11.9
*2000	11.3

3. Fast-food sales for years since 2000 in the US are shown in the table.
    a) Determine the linear model equation for this data by hand (not the calculator) using the two starred (*) points above. Use the variables *t* and *s* for your answer. b) Use the model equation to predict food sales for 2010, and write the meaning of your result in a complete sentence with correct units. c) Use the model equation to predict the year when food sales will be $200 billion, and write the meaning of your result in a complete sentence with correct units.

Fast-Food Sales in the United States	
Year	Sales (Billions of Dollars)
*2001	88.8
2002	92.5
2003	97.5
*2004	101.4
2005	105.5

4. The linear model equation $n = -0.60t + 17.54$ represents the number of world refugees (in millions) at *t* years since 1990. a) Give the slope of the model and write its meaning in a complete sentence with correct units. b) Determine the n-intercept of the model. Write the ordered pair. Write the meaning of your result in a complete sentence with correct units. c) Determine the t-intercept of the model. Write the ordered pair. Write the meaning of your result in a complete sentence with correct units.

5. The number of amusement park injuries from roller coasters was 4300 injuries in 2000 and has decreased by about 450 injuries per year. Let *t* be the years since 2000 and *n* be the number of injuries from roller coasters.
    a) Write the linear equation which models this information. Use the variables n and t for your answer.
    b) Determine n when $t = -5$. Write the meaning of your result in a complete sentence with correct units.

6. Average tuitions at four-year colleges are listed below for various years since 1980.
    a) Use the regression feature of your calculator to determine the linear model equation for public tuition at *t* years since 1980. b) Write the meaning of slope for the public linear model in a complete sentence with correct units. c) Use the calculator to determine the linear model for private tuition at *t* years since 1980. d) Write the meaning of slope for the private linear model in a complete sentence with correct units. e) Compare the two slopes of the two models and write the meaning of the comparison in this situation.

Average Tuitions at Four-Year Colleges		
Year	Public Tuition (dollars)	Private Tuition (dollars)
1984	2074	9202
1989	2395	12146
1994	3188	13844
1999	3632	16454
2004	4694	19710

Answers

1. $m = -1300\ dollars/year$; The value of the car is decreasing by $1300 per year.
2. a) Refer to graph at the end of the solutions; b) $m = -0.6\ \%/year$; From the year 1996 to the year 2000 the percentage of Americans living below the poverty level decreased by 0.6 per year.
3. a) $s = 4.2t + 84.6$ b) $s(10) = 126.6$; In 2010, fast-food sales in the US will be $126.6 billion. c) $t \approx 27$, In 2027, fast-food sales in the US will be $200 billion.
4. a) $m = -0.60\ million\ refugees/year$; The number of world refugees is decreasing by 0.60 million per year. b) $(0, 17.54)$; In 1990, there were 17.54 million world refugees. c) $(29,0)$; In 2019, there will be no world refugees. (Most likely a model breakdown.)
5. a) $n = -450t + 4300$ b) $n(-5) = 6550$; In 1995, there were 6550 injuries from roller coasters.
6. a) $y = 129.54x + 1383.04$ b) Public tuition is increasing by $129.54 per year. c) $y = 506.48x + 7180.48$ d) Private tuition is increasing by $506.48 per year. d) Private tuition is increasing at a faster rate than public tuition.

Graph for problem #2

% of Americans Living Below the Poverty Level