EXAM 3 - MATH 111 YOUR NAME:

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

- 1. For the purposes of this problem think of the Mississippi River as a straight line beginning at its headwaters, Lake Itasca, Minnesota, at an elevation of 1475 feet above sea level, and sloping downward to the Gulf of Mexico 2340 miles to the south.
 - (a) Think of the southward direction as pointing to the right along the horizontal axis. What is the slope of the line representing the Mississippi River? Be sure to indicate what units you are using.

(b) Memphis, Tennessee, sits on the Mississippi River 1982 miles south of Lake Itasca. What is the elevation of the river as it passes through Memphis?

(c) How many miles south of Lake Itasca would you find the elevation of the Mississippi to be 200 feet?

- 2. A real estate agency has fixed monthly costs associated with rent, staff salaries, utilities and supplies. It earns its money by taking a percentage commission on total real estate sales. During the month of July, the agency had total sales of \$ 832,000 and showed a net income (after paying fixed costs) of \$ 15,704. In August total sales were \$ 326,000 with a net income of only \$ 523.
 - (a) Use a formula to express net income as a linear function of total sales. Be sure to identify what the letters that you use mean.

(b) Plot the graph of net income and identify the slope and vertical intercept.

- (c) What are the real estate agency's fixed monthly costs?
- (d) What percentage commission does the agency take on the sale of a home?
- (e) Find the horizontal intercept and explain what this number means to the real estate agency.

3. A scientist collected the following data on the speed, in centimeters per second, at which ants ran at the given ambient temperature, in degrees Celsius.

(a) Find the equation of the regression line, giving the speed as a function of temperature.

(b) Explain in practical terms the meaning of the slope of the regression line.

(c) Express, using functional notation, the speed at which the ants run when the ambient temperature is 29 degrees Celsius, and then estimate that value.

(d) The scientist observes the ants running at a speed of 2.5 centimeters per second. What is the ambient temperature?

4. The table below shows the average salaries, in thousands of dollars, of elementary and secondary classroom teachers in public schools in the given year:

Year	Elementary	Secondary
2001	42.9	44.0
2002	44.1	45.2
2003	45.4	46.0
2004	46.4	47.0
2005	47.4	48.0

(a) Find a regression line for the average salary of an elementary school teacher versus time.

(b) Find a regression line for the average salary of a secondary school teacher versus time.

(c) Assuming that the trends will continue, on the basis of these regression lines, when would you expect that the average salary for elementary teachers in public schools will be the same as that for secondary schools?

- 5. In your garden you have space for 55 small flowering bulbs. Crocus bulbs cost \$ 0.35 each and daffodil bulbs cost \$ 0.75 each. Your budget allows you to spend \$ 25.65 on bulbs.
 - (a) Let c be the number of crocus bulbs and d the number of daffodil bulbs you can afford. Write two linear equations involving c and d reflecting the data in the statement above.

(b) Use either substitution or elimination to find the number of crocus bulbs and the number of daffodil bulbs that you can buy.