Homework #2   Name: _____
Chapters 11 & 5
Due: in class Nov. 25th
Directions: You may work with others (I encourage it), but make sure you write up the answers
by yourself and in your own words. Your work should be *neat and easy to follow*. Be sure to label
where appropriate. If you use your calculator to do something, tell what you did.

1. A deposit of $75,000 is made into an account paying interest compounded monthly at 6.5%
   per year. Annual payments of $8000 each, starting now, will be made out of the account.
   How many payments can be made before the account runs out of money?

2. Two competing retail stores open in the same mall at time $t = 0$ and have the marginal revenue functions given in the figure. The marginal revenue is measured in thousands of dollars per day. Estimate the point in time, other than $t = 0$, for which the total sales of the two stores are equal. Justify your answer.
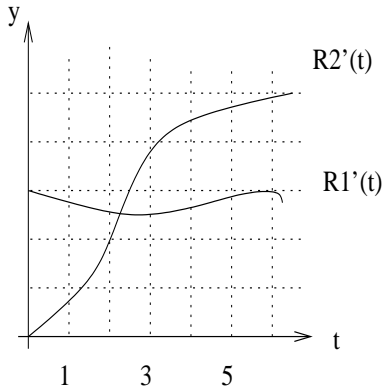

3. The marginal cost function for a certain company is given by $C'(q) = q^2 - 16q + 70$ dollars/unit, where q is the quantity produced. If $C(0) = 500$,

   a. find an expression for the total variable costs of producing x units.

   b. find the total cost of producing 20 units.

4. Below is the graph of the rate r in arrivals/minute at which students line up for breakfast. The first people arrive at 6:50 a.m. and the line opens at 7:00 a.m. Suppose that once the line is open, checkers can check peoples' meal cards at a constant rate of 24 people per minute.
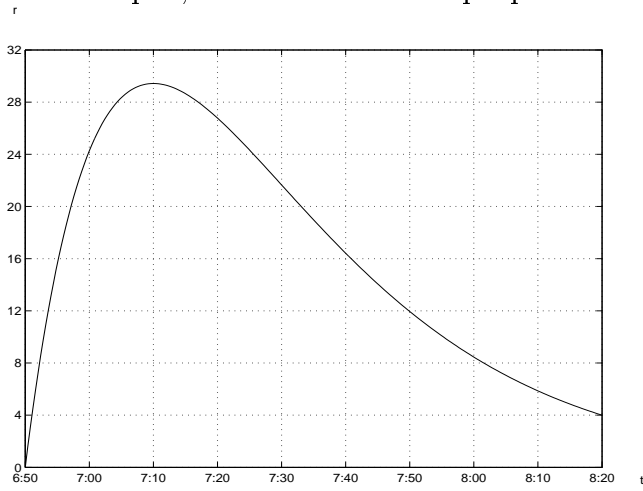
a. Approximately how many people are in line at 7:00 when the checkers begin?

b. At what time is the line the longest? Why? Approximately, how many people are in the line at this time?

c. At approximately what time does the line disappear? Show work.

5. For a certain product, a company has marginal cost and marginal revenue functions given by $MC = .0027q^2 - .66q + 41$ and $MR = 38 - 3\ln q$. Currently the company produces 155 units per month with a profit of \$1943/month.

    a. If the company increases the production level to 250 units/month, what will be the monthly profit? (units)

    b. Based on values of marginal cost and marginal revenue, is 250 units/month the optimal production level, or could the company do better by producing more (or less)? Explain.

6. The number of arrests for marijuana sales and possession in Atlanta grew at a rate of approximately $f(t) = 0.0125t^4 - 0.01389t^3 + 0.55417t^2 + 0.53294t + 4.95238$ $(0 \le t \le 5)$ thousand per year, where t is measured in years, with $t = 0$ corresponding to the beginning of 1992. Find the approximate number of marijuana arrests in the city from the beginning of 1992 to the end of 1996.