Review Problems for First Midterm
Math 192
Spring 2009

(1) A person made an investment at 6.5% compounded annually. It has grown to \$798.75 in 1 year. How much was originally invested? (Set up an equation but DO NOT solve).

(2) Graph by hand $y = |4 - x|$.

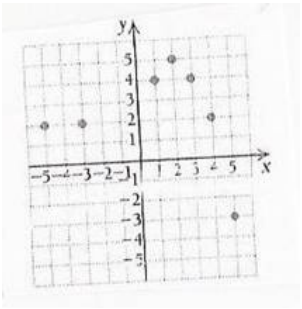
(3) A function is given by $f(x) = -x^2 + x$. Find each of the following:
   (a) $f(3)$
   (b) $f(-5)$
   (c) $f(a)$
   (d) $f(x + h)$

(4) Graph the function given by

$$f(x) = \begin{cases} -x^2 + 2, & \text{for} \quad x < 1 \\ 4, & \text{for} \quad 1 \leq x \leq 2 \\ 0.5x, & \text{for} \quad x > 2 \end{cases}$$

(5) Find the domain of f.
   (a) $f(x) = \sqrt{x + 6}$
   (b) $f(x) = \frac{7}{2x-10}$

(6) Given the following graph, answer the questions (using mathematical notation):



   (a) $f(1)$
   (b) The domain.
   (c) All values of x such that $f(x) = 2$.

(7) A printing shop has fixed costs of \$8000 for producing a newly designed note card. Thereafter, the variable costs are \$0.10 per card. The revenue from each card is expected to be \$0.50.
   (a) Formulate a fucntion $C(x)$ for the total cost of producing x cards.
   (b) Formulate a function $R(x)$ for the total revenue from the sale of x cards.
   (c) Formulate a function $P(x)$ for the total profit from the production and sale of x cards.
   (d) How many cards must the company sell in order to break even?

(8) The amount A that Pet-Treats-to-U charges for shipping is directly proportional to the value V of the item(s) being shipped. If the business charges \$2.10 to ship a \$60 gift basket, find an equation of variation expressing A as a function of V.

(9) A company's revenue is described as a function of time (in years from 1980) by $R(t) = t^2 - 4t + 10$. (Use what you know about quadratics to find) In which year was the revenue the smallest?

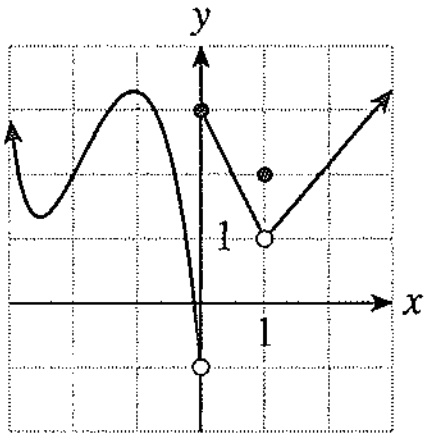
(10) The supply curve for sauerkraut is given by $q = 5x + 2$, where q is pounds of sauerkraut. The demand curve for sauerkraut is given by $q = \frac{-x^2}{2} + 50$.
  (a) Sketch the graphs of supply and demand on the same axis.
  (b) Algebraically determine the equilibrium point. Interpret your answer.

(11) Use the following data set to answer the questions below.

x	y
1	3.75
3	7.75
4	-9
6	-10
10	-1

  (a) Use the first and last data point find a linear model for the data.
  (b) Graph the data points and your linear model on the same axis. Does your linear model fit the data well? Is there a different kind of function that might fit the data better? If so, what kind of function might that be?

(12) Use the graph of the function $f(x)$, given below, to calculate the following quantities (if they exist).



  (a) $\lim_{x \to -2^-} f(x) =$
  (b) $\lim_{x \to -2^+} f(x) =$
  (c) $\lim_{x \to -2} f(x) =$
  (d) $\lim_{x \to 0^-} f(x) =$
  (e) $\lim_{x \to 0^+} f(x) =$
  (f) $\lim_{x \to 0} f(x) =$
  (g) $\lim_{x \to 1^-} f(x) =$
  (h) $\lim_{x \to 1^+} f(x) =$
  (i) $\lim_{x \to 1} f(x) =$
  (j) $f(-2) =$
  (k) $f(0) =$
  (l) $f(1) =$
  (m) Is $f(x)$ continuous at -2? 0? 1? Why?

(13) Differentiate the following functions (without using your calculator):
  (a) $f(x) = 3x^2 + 2x - 4$
  (b) $f(x) = (2\sqrt{x} - x)(x^7 + 2)$
  (c) $f(x) = \frac{3x^4 - 3}{x^2 + 2}$
  (d) $f(x) = (8 - x)^{90}$
  (e) $f(x) = x^7 \sqrt{(x^2 + 1)/(x - 1)}$

(14) Find the tangent line to $y = \sqrt{x^2 + 7}$ when $x = 3$.

(15) Suppose that the profit in dollars from selling x cellphones is given by $P(x) = -2x^2 + 100x + 50$.
   (a) What is the average profit per cellphone when you sell x cellphones?
   (b) At what rate is the average profit per cellphone changing when $x = 100$?

(16) If the number of high school math teachers in the United States, measured in thousands, from 1995 to 2000 is modeled by $E(t) = 2t^2 - t + 500$ where t is the number of years since 1995. What is the average rate of change in the number of math teachers in the United States, measured in thousands, from 1995 to 2000?

(17) Let $f(x) = 2/x$.
   (a) What is the difference quotient for f?
   (b) What does this difference quotient represent graphically? As part of your answer draw a graph.