

## Math 234 Practice Exam 1

1) Differentiate the following functions.

a)  $f(x) = \sqrt{x^2 + 3x - 1}$

b)  $r(t) = \frac{4}{3t^2 + 1}$

c)  $g(x) = (x^2 + 5)^2(\sqrt{x} + 5)$

2) Find the equation of the tangent line to the graph of

$$y = \frac{1}{6}x^3 - x^2 - x + 4$$

at  $x = 2$ .

3) Use derivatives to estimate  $\sqrt{65}$ .

4) a) State the limit definition of the derivative.

b) Use the limit definition of the derivative to compute  $f'(x)$

if  $f(x) = \frac{2}{x}$ .

5) A sporting goods store sells 100 pool tables per year. It costs \$20 to store one pool table for one year. To reorder pool tables, there is a fixed cost of \$40 plus \$16 for each pool table. How many times a year should the store order pool tables, and in what lot size, to minimize inventory costs? **Explain your work and include units with your answer.**

6) A manufacturer has been selling 1000 personal computers a week at \$450 per computer. A market survey indicates that for each \$10 rebate offered to the buyer, the number of computers sold will increase by 100 per week.

a) Find the demand function for the number of computers sold in terms of the rebate size.

b) Find the formula for the price of a computer in terms of the rebate size.

c) How large a rebate should the company offer the buyer to maximize its revenue?

7) Let  $f(x) = x^3 + x^2 - x$ .

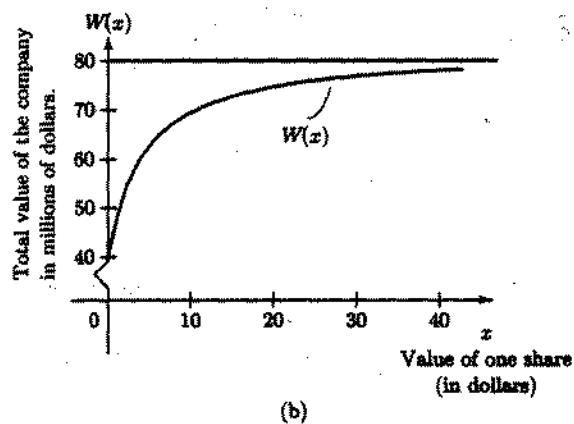
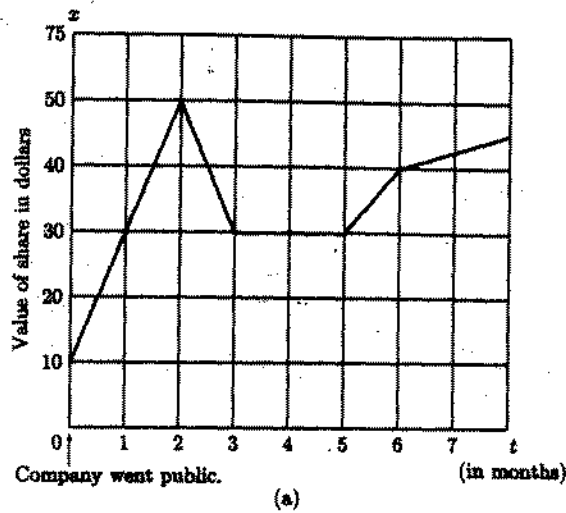
a) Find the  $x$ -coordinates of the relative extreme points of  $f$  and, for each relative extreme point  $x = a$ , use the second derivative to determine whether  $f$  has a relative minimum, relative maximum, or neither at  $x = a$ .

b) Find the  $x$ -coordinates of the inflection point of  $f$  and *justify* that the concavity changes at this point.

- 8) After a computer software company went public, the price of one of its shares on the stock market fluctuated according to the graph in Figure (a). The total worth of the company depended on the value of one of its shares and was estimated to be

$$W(x) = 10 \frac{12 + 8x}{3 + x},$$

where  $x$  is the value of one share (in dollars) and  $W(x)$  is the total value of the company in millions of dollars [See Figure (b)].



a) Find the total value of the company when  $t = 1.5$ .

b) Find  $\left. \frac{dx}{dt} \right|_{t=1.5}$ . Give a real world interpretation of this value.

c) Use the chain rule to find  $\left. \frac{dW}{dt} \right|_{t=1.5}$ . Give a real world interpretation of this value.