Math 1730 **Test #1B** **Spring 2013**

Name: _____

Rocket Number: _____

Instructor: _____

Recitation Section (circle): 011 012 021 022 031 032 041 042 961

Photo ID Checked: _____
(Signature of Proctor or Instructor)

I verify that I am the above named student: _____
(Student signature)

Make sure you show **ALL YOUR WORK**. The answer alone will just receive partial credit (unless the question is a one-step question) – you need to demonstrate you know how to calculate the answer.

1. Find each of the given limits:

a. (4 points) $\lim_{x\to 4}\sqrt{2x-5}$ $=\sqrt{3}$

b. (6 points) $\lim_{x\to 3}\dfrac{x^2-9}{x^2-4x+3}$ $=3$

2. A college club starts selling sweatshirts for $19 as a fundraiser. If each sweatshirt costs $12.50 to order and the club has fixed costs of $221 to design and order the sweatshirts, find each of the following:

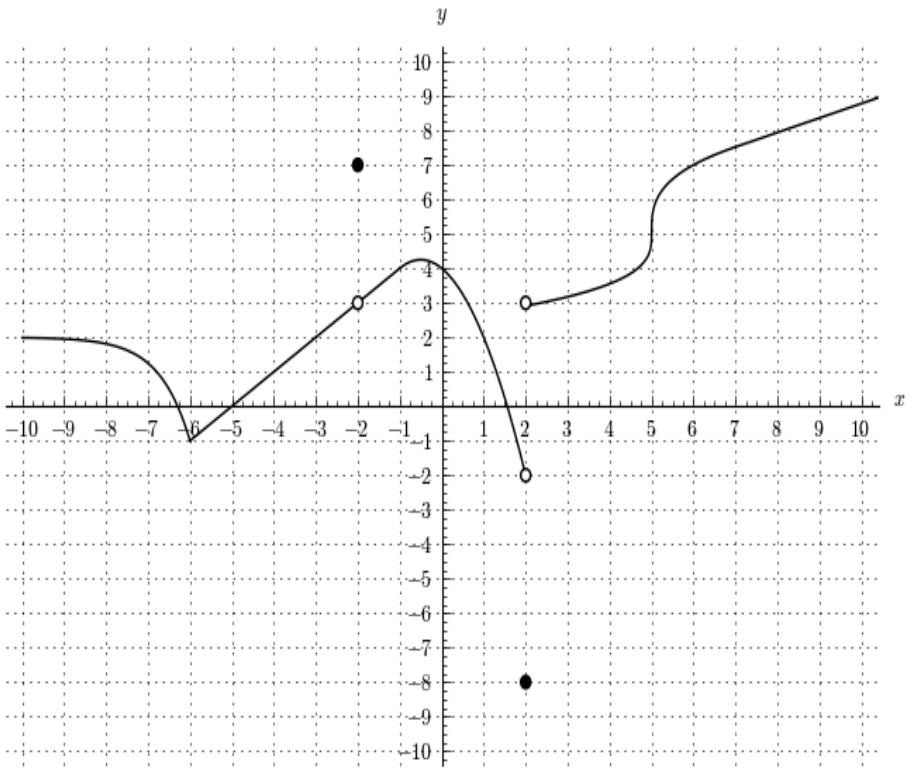
a. (2 points) The cost function

b. (2 points) The revenue function

c. (4 points) The profit function

d. (4 points) The break-even quantity

3. (18 points) Given the following graph, find each of the following:



a. For what value(s) of x is the function discontinuous? -2,2

b. For what value(s) of x is does the derivative not exist? -2,2,-6

c. $\lim_{x\to -2^-} f(x) =$ 3

d. $\lim_{x\to -2^+} f(x) =$ 3

e. $\lim_{x\to -2} f(x) =$ 3

f. $f(-2) =$ 7

g. $\lim_{x\to 2^-} f(x) =$ -2

h. $\lim_{x\to 2+} f(x) =$ 3

i. $\lim_{x\to 2} f(x) =$ DNE

j. $f(2) =$ -8

k. $\lim_{x\to 5^-} f(x) =$ 5

l. $\lim_{x\to 5^+} f(x) =$ 5

m. $\lim_{x\to 5} f(x) =$ 5

n. $f(5) =$ 5

4. (10 points) Find the equation of a tangent line to the graph of $f(x) = 4x^3 - 5x + 10$ at the point (-1, 11)

f' =12x^2-5 f'(-1)=7 The tangent line is y -11 =7(x+1)

or y = 7x+18

5. (10 points) For $f(x) = x^2 - 4x - 3$, calculate $f'(x)$ using the definition of the derivative,

$$\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$$

f(x+h)-f(x) = (x+h)^2-4(x+h) -3 - (x^2-4x-3) = x^2+2xh+h^2-4x-4h -3-x^2+4x+3

= 2xh +h^2 -4h =h(2x+h-4)

$\frac{f(x+h)-f(x)}{h}$ = 2x+h-4

$\lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ = $\lim_{h\to 0}$ 2x+h -4 =2x-4 =f'(x)

6. (10 points) The dollar value of a piece of real estate grows to a value V given by $V = 300{,}000 + 1000t^2$ where t is in years.

a. Find the value of the real estate after 12 years

444,000

b. Find the rate of change of the value of the real estate, dV/dt

2000 t

c. Find the rate of change of the value of the real estate at $t = 12$

24,000

7. Calculate the values of each of the following derivatives:

a. (5 points) $f(x) = 5x^7 - 3x^5 + 4x^3 - 2x + 4$

f'(x) $= 35x^6 - 15x^4 + 12x^2 - 2$

b. (5 points) $f(x) = 4x^{-3} + 12x^{1/3}$

f'(x) $= -12x^{-2} + 4x^{-2/3}$

c. (5 points) $g(x) = \frac{7}{x^3} + 3\sqrt{x} = 7x^{-3} + 3x^{1/2}$

g'(x) $= -21x^{-4} + (3/2)x^{-1/2}$

d. (5 points) $f(x) = (4x^2 - 7x - 5)^6$

f'(x) $= 6(4x^2 - 7x - 5)^5 (8x - 7)$ Extended power rule (not on this test)

e. (5 points) Use the product rule: $f(x) = (x^2 - 3x)(5x^3 + 4)$

f'(x) $= (5x^3 + 4)(2x - 3) + (x^2 - 3x)(15x^2)$ by the product rule

f. (5 points) $f(x) = \frac{x^2 + 4x}{5 - 6x^2}$

f'(x) $= \frac{(2x+4)(5-6x^2) - (x^2+4x)(-12x)}{[5-6x^2]^2}$ by the quotient rule