Test 2D - MTH 1310
Dr. Graham-Squire, Fall 2012

Name: _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

_____
(signature)

DIRECTIONS

1. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.

2. Clearly indicate your answer by putting a box around it.

3. Cell phones and computers are <u>not</u> allowed on this test. Calculators <u>are</u> allowed on the first 5 questions of the test, however you should still show all of your work. No calculators are allowed on the last 4 questions.

4. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.

5. If you need to use the quadratic formula, it is $\dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.

6. Make sure you sign the pledge.

7. Number of questions = 9. Total Points = 90.

1

1. (10 points) For a certain brand of TV, the revenue and cost functions are given by

$$R(x) = 500x - 0.04x^2$$

and
$$C(x) = 0.000002x^3 - 0.05x^2 + 400x + 90,000$$

where $R(x)$ and $C(x)$ are in dollars and x is the number of TVs produced.

(a) Find the profit function $P(x)$.

(b) Find $P'(5000)$, round your answer to the nearest whole number. What does it mean?

(c) Find $P'(6500)$, round your answer to the nearest whole number. What does this tell you about what the appropriate level of production should be?

2. (12 points) Let $f(x) = \begin{cases} \dfrac{(x-2)}{x^2-4} & \text{if } x \le 3 \\ x^2 - 5 & \text{if } 3 < x < 4 \\ x + 7 & \text{if } x \ge 4 \end{cases}$

(a) Find the following limits. Write DNE if the limit does not exist.

(i) $\lim\limits_{x \to 3^-} f(x) =$

(ii) $\lim\limits_{x \to 3^+} f(x) =$

(iii) $\lim\limits_{x \to 3} f(x) =$

(iv) $\lim\limits_{x \to 4^-} f(x) =$

(ii) $\lim\limits_{x \to 4^+} f(x) =$

(iii) $\lim\limits_{x \to 4} f(x) =$

(b) Find all values of x where the function $f(x)$ is not continuous. Give a brief explanation/reason why the function is not continuous at that value of x. (Hint: for a function to be discontinuous it must fail one part of the definition of continuity.)

3. (12 points) Calculate the limits. Write DNE if the limit does not exist. Make sure you use correct notation or you will lose points.

(a) $\lim\limits_{x \to 2} \dfrac{3x}{x^2 - 9}$

(b) $\lim\limits_{x \to (-5)} \dfrac{x^2 + 10x + 25}{x^2 - 25}$

(c) $\lim\limits_{x \to (-\infty)} \dfrac{3x^6 + 7x^4 - 100}{8x^2 + 11}$

4. (10 points) For the hit song "Mo math mo problems", the total worldwide revenues are approximated by the function

$$M(x) = \frac{140x^2}{x^2 + 2}$$

where $M(x)$ is measured in millions and x is the number of years since the songs release.

(a) How fast are the total revenues changing 3 years after the songs release? Round to the nearest 0.01.

(b) What will be the total revenues in the long run?

5. (10 points) Steve leads backpacking trips for groups of people. He needs a group of at least 20 to run a trip, and if there are only 20 people then he charges them \$200 per person. If there are more than 20 people in the group (up to a maximum of 35), he charges \$4 less per person (thus if there are 21 people in the group, each person in the group only has to pay \$196). Let x be the number of people in the group above 20. Write an equation that gives the total revenue Steve will get from a trip, in terms of x.

Name:_____

6. (10 points) Find the derivative of

$$f(x) = \left((x - 3)(x^4 - 3x)\right)^8.$$

You do not need to simplify your answer.

7. (8 points) Find the second derivative $f''(x)$ of the function

$$f(x) = (x^3 - 9)^6.$$

8. (8 points) Find $f'(x)$ if $f(x) = \dfrac{x^7 - 3x^3 - \sqrt[3]{x}}{x^4}$. Simplify your answer.

9. (10 points) (a) Find $f'(x)$ if $f(x) = x^2(3x^3 + 2x - 10)$. Simplify your answer.

(b) Find the equation of the tangent line at $x = 1$.

Extra Credit(2 points) A cannon shoots a cannonball straight up into the air, and the height of the cannonball is given by the function $h(t)$. You are told that $h'(t) = -4t^3 - 34t^2 - 6$. Does this seem to be accurate? Why or why not?