NAME_____

Math 1212
Test 1
Spring 2016

You have 50 minutes to complete this test. You must *show all work* to receive full credit. Work any 7 of the following 8 problems. Clearly **CROSS OUT** the problem you do not wish me to grade. Each problem is worth 14 points, and you get 2 points for free, for a total of 100 points. If you have any questions, please come to the front and ask.

1. Using the definition of the derivative, find $f'(x)$ if $f(x) = x^2 - 3x + 1$.

2. Evaluate the following limits. If any of them do not exist, EXPLAIN why not ("because it's undefined" or "denominator is zero" are not sufficient explanations).

(a) $\lim_{x \to 5} \dfrac{x+1}{x+5}$

(b) $\lim_{x \to 3} \dfrac{9 - x^2}{x - 3}$

(c) $\lim_{x \to -2^-} \dfrac{x+1}{x+2}$

3. Suppose all x units of a product can be sold if the price is set at $p(x) = -x^2 + 4x + 10$. Also assume that the total cost to produce all x units is $C(x) = \frac{1}{3}x^2 + 2x + 39$.

(a) Find an equation for profit when x units are produced.
(b) Using marginal analysis, estimate the change in profit derived from the production and sale of the 5^{th} unit.

4. Find $f'(x)$ if :

a) $f(x) = \frac{2x-3}{x^3}$

b) $f(x) = x^3 - \frac{1}{3x^5} + 2\sqrt{x} + \sqrt{2}$

5. Find the equation of the line tangent to $f(x)=(2x+1)(x^2-x+3)$ at the point where $x=0$.

6. Graph the function $f(x)=\begin{cases} x^2-3x+2 & \text{if} \quad x\le 3 \\ x+1 & \text{if} \quad x>3 \end{cases}$. Your graph should be clearly labeled and large enough for me to see everything easily.

(a) For what values of x is $f(x)$ discontinuous?

(b) Find $\lim_{x\to 0} f(x)$.

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

(d) Find $\lim_{x\to 3^+} f(x)$.

(e) Find $\lim_{x\to 3} f(x)$.

7. Suppose that the total cost to produce x units of a commodity is given by $C(x) = 2x^2 - 12x + 30$ dollars. Using calculus, determine how many units should be produced in order to minimize cost. What is the minimum cost?

8. Find the derivative of $y = \dfrac{(3x+1)^2}{\left(\sqrt[3]{x^2} + 10x^3\right)\left(2x^4 - 6\right)}$.