Name:_____

Math 221 Section 16279 *Practice Exam 1* *September 24, 2009*

Follow the instructions for each question and show enough of your work so that I can follow your thought process. If I can't read your work or answer, you will receive little or no credit!

For problems 1-3, compute the following limits if they exist.

1. $\lim_{x \to 3} \dfrac{x^2 - 5x + 6}{x^2 - 2x - 3}$

2. $\lim_{x \to \infty} \dfrac{4x^3 + 3x + 1}{7x^3 - 8x^2 + 13}$

3. $\lim_{x \to \infty} \left(\sqrt{x^2 + x + 1} - \sqrt{x^2 - x} \right)$

Find the derivative of the following function using the four-step process. All other methods will have zero point value.

4. $\varphi(x) = 2x^2 + x + 6$

For problems 5-8, differentiate the following functions with respect to the indicated independent variable.

5. $f(x) = \dfrac{x^3 + 3x - 1}{x^2 + 7}$

6. $y = \left(3x^3 + 2\right)^{2000}$

7. $h(r) = (5r - 6)^5(r^3 - 7)^7$

8. $y^7 + x^3y^2 = y^2 - x^6$, here the function is defined implicitly, so find $\dfrac{dy}{dx}$.

For problems 9 and 10, find the equation of the tangent line of the following functions at the indicated point.

9. $y = (1 - 5x)^{13}$, at $(0, 1)$

10. $x^3 + y^3 = 54$, at $(3, 3)$

For the following function: find all critical values, critical points, inflection points, relative max/min, absolute max/min (if any), where the function is increasing/decreasing, where it is concave up /concave down, and sketch the graph.

11. $h(x) = x^4 - 4x^3$

12. Find two real numbers whose difference is 100 and whose product is minimal.

13. Let $f(x) = x^6$, Find $\dfrac{d^6 f}{dx^6}$