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. The answers will be posted on the electronic reserves later today.

1.   Suppose $f(x) = \dfrac{1-x}{x^2}$. List the intervals where the function is increasing and where it is decreasing, and find all of the maximum and minimum *points*.

2.   For the following functions, find all horizontal and vertical asymptotes (remember that an asymptote is a LINE, not a number). If there are no asymptotes, say so.

(a) $f(x) = \dfrac{2x^2}{x^2 + x - 6}$

(b) $f(x) = \dfrac{x}{x^2 - 4x}$

(c) $f(x) = x^2 - 5x + 5$

3.   Suppose $q(p) = p^2 - 40p + 400$ units of a product are demanded when price is p (in thousands of dollars) per unit.

   a) Calculate the price elasticity of demand when $p = 15$. At this price, is the demand elastic or inelastic?

   b) Write a sentence explaining the meaning of your answer in (a) in plain language. Be as specific as possible.

   c) Give an example of a product that might behave this way.

4.   Sketch a nice BIG graph of a function with all the properties listed below. Make sure your graph is clearly labeled.

   a) $f'(x) > 0$ on the interval $(2,3)$, but $f'(x) \leq 0$ otherwise
   b) $f''(x) > 0$ on the interval $(1,3) \cup (3,\infty)$, but $f''(x) \leq 0$ otherwise
   c) $f(x)$ is undefined when $x = 3$
   d) $\lim\limits_{x \to -\infty} f(x) = -1$.

5.　Find $f'(x)$ for the following functions. DO NOT simplify!

(a)　$f(x) = \left(\dfrac{2x+5}{x^2+1}\right)^4$

(b)　$f(x) = \sqrt{2x} + \dfrac{1}{\sqrt{2x}}$

(c)　$f(x) = (6x+1)^7 (2x-3)^3$

6.　Find the equation of the line tangent to the graph of $y^2 + xy - x^2 = 5$ at the point $(4,3)$.

7. Find the absolute minimum and absolute maximum *points* of $f(x) = \dfrac{x}{x^2 + 1}$ on the interval $0 \le x \le 2$.

8. A satellite TV company has 4800 subscribers to an add-on package who are each paying \$18 per month for the bonus channels. The company can get 150 more subscribers for each \$0.50 decrease in the monthly fee. What rate will yield the maximum revenue (be sure your solution is a *maximum*), and what will this maximum revenue be?

NAME_____

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