

NAME _____

Math 1212
Test 2
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. The answers will be posted on the electronic reserves later today.

1. List the intervals where $f(x) = \frac{x^2}{x+1}$ is increasing and the intervals where it is decreasing. Also, find all 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) $f(x) = \frac{x(x-2)}{3x^2+7}$

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

c) $f(x) = \sqrt{x}$

3. Suppose $q(p) = \sqrt{2500 - p}$ units of a product are demanded when price is p dollars per unit.

a) Calculate the price elasticity of demand when $p = 1600$. 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 in the correct price range that might behave this way.

4. Find the derivatives of the following functions:

a)
$$f(x) = \frac{4x^2 - 5}{(3x^4 + 1)^2}$$

b)
$$f(x) = (2x - 9)^4 \sqrt{6x + 7}$$

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

- (a) $f'(x) > 0$ when $-1 < x < 1$, but $f'(x) \leq 0$ otherwise
- (b) $f''(x) > 0$ when $-2 < x < 1$ and when $1 < x$, but $f''(x) \leq 0$ otherwise
- (c) $f(x)$ is defined for all x except $x = 1$
- (d) $\lim_{x \rightarrow -\infty} f(x) = 0$.

6. Find the equation of the line tangent to $x^3 y^3 + x = 9$ at the point $(1, 2)$.

7. Find the absolute minimum and absolute maximum *points* of $f(x) = 3x^4 - 6x^2$ on the interval $[0,2]$. If such points do not exist, say so and explain why not.
8. Ms. Jones owns a small insurance agency that sells policies for a large insurance company. For each policy sold, Ms. Jones (who does not sell policies herself) is paid a commission of \$50 by the insurance company. Ms. Jones has determined that when she hires x salespeople, $q(x) = x^3 - 12x^2 + 60x$ policies will be sold each week. She pays each salesperson \$750 per week, and her weekly fixed costs are \$2500. Current office facilities can accommodate at most seven salespeople. Determine the number of salespeople Ms. Jones should hire in order to maximize her weekly profit. You must use calculus to solve this problem; “guess and test” methods will not receive credit.