

NAME \_\_\_\_\_

Math 12  
Test 1  
Summer 2011

You have 60 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  $f(x) = \sqrt{2x+3}$ .

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

(a)  $\lim_{x \rightarrow 3} \frac{x+3}{x^2-9}$

(b)  $\lim_{x \rightarrow 5} \sqrt[3]{x^2-17}$

(c)  $\lim_{x \rightarrow 0} \frac{x^2+3x}{x-2x^4}$

3. The quantity  $x$  of a particular home office copier is *inversely proportional* to the price  $p$ . If the price is \$320 each, 240,000 copiers will be sold. How many will be sold if the price is \$480 each?

4. Find  $f'(x)$  (do not simplify!) if:

a)  $f(x) = (\sqrt[3]{x} - 5x^2 + 4)(4x^2 + 11x^{-3} - 5)$

b)  $f(x) = \frac{5x^8 - 2x^3}{(x^5 - 3)(x^4 + 7)}$

5. Suppose a company can sell  $x$  units of a product if the price is set at  $p(x) = 50 - 0.5x$ , and that the total cost of producing all  $x$  units is  $C(x) = 4x + 10$ .

a) Write an equation to express the revenue from selling  $x$  units of the product.

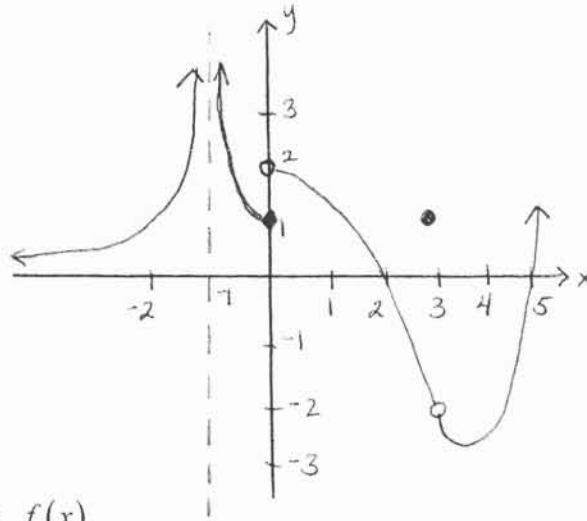
b) Write an equation to express the profit from selling  $x$  units of the product.

c) What is the *actual* profit obtained from the production and sale of the 21<sup>st</sup> unit?

d) What is the *marginal* profit obtained from the production and sale of the 21<sup>st</sup> unit?

6. Find the equation of the line tangent to  $f(x) = \frac{12x^2 - 3x}{3\sqrt{x}}$  at the point where  $x = 1$ .

7. Consider the graph of the function  $f(x)$  given below.



- (a) Find  $\lim_{x \rightarrow -1} f(x)$ .
- (b) Find  $\lim_{x \rightarrow 2} f(x)$ .
- (c) Find  $\lim_{x \rightarrow 0^-} f(x)$ .
- (d) Find  $\lim_{x \rightarrow 0^+} f(x)$ .
- (e) Find  $\lim_{x \rightarrow 0} f(x)$ .
- (f) Find  $\lim_{x \rightarrow 3} f(x)$ .
8. Sketch a graph of the function  $f(x) = \begin{cases} -x^2 + 2x + 2 & \text{if } x < 1 \\ 2x - 2 & \text{if } x \geq 1 \end{cases}$ . Is this function continuous at  $x = 1$ ? Explain why or why not.