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  $f(x) = 2 - \frac{x}{4} - x^2$ .

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) 
$$\lim_{x\to 3^{-}} \frac{x+3}{x^2-9}$$

(b) 
$$\lim_{x \to -5} \frac{2x^2 + 9x - 5}{x^2 + 5x}$$

(c) 
$$\lim_{x \to 1} \frac{2x^2 + x - 3}{x^3 + 4}$$

3. Find the equation of the line through (4,-7) and perpendicular to the line 3x + 2y = 1.

4. Find y' for the following functions (do not simplify):

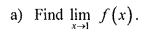
a) 
$$y = \left(8x^2 - 3\sqrt{x} + \frac{3}{4x^2}\right)\left(5x^{-3} + 7\right)$$

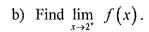
b) 
$$y = \frac{\sqrt[3]{x} + 1}{3x^4 - 5}$$

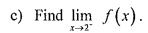
- 5. Suppose a company produces x custom tablets each week, and it costs the company \$350 per tablet to produce them. Suppose the company sells each tablet for 800 x dollars, and at that price all of the tablets will be sold.
  - a) Find the revenue equation.
  - b) Find the profit equation.
  - c) What is marginal profit?
  - d) If the company is currently producing 160 netbooks per week, should it increase or decrease production in order to raise its profit? Explain your answer.

6. Find the equation of the line tangent to  $f(x) = \frac{\sqrt{x(2-x^2)}}{x}$  at the point where x = 4.

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



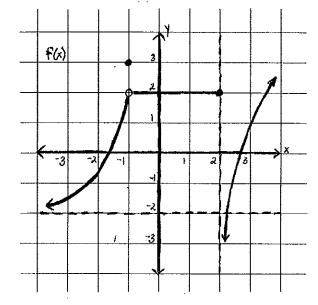




d) Find 
$$\lim_{x\to 2} f(x)$$
.

e) Find 
$$\lim_{x\to -1} f(x)$$
.

f) Find 
$$\lim_{x \to -\infty} f(x)$$
.



- g) List the intervals where f(x) is continuous.
- 8. Graph the function  $f(x) = \begin{cases} \frac{1}{x} & \text{if } x \le 2 \\ x & \text{if } x > 2 \end{cases}$ . Be sure your graph is large enough

for me to see and that it is clearly labeled. Then describe the continuity of the function based on your graph.