EXAM 1 - MATH 112 Your name:

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. (a) Find an equation for the line passing through the point (-7, 11) that is perpendicular to the line with equation x + 2y = -20.

(b) Simplify the following expression and write your answer without negative or fractional exponents:

$$\left(\frac{x^2y^{-1/3}}{2\sqrt{x^5}y^2}\right)^{-2} =$$

2. (a) Graph the piece-wise defined function

$$f(x) = \begin{cases} -x^2 - 2x + 3, & \text{if } x \le 0\\ x - 1, & \text{if } x > 0 \end{cases}$$

You must graph neatly and label all points of interest (vertices, intercepts) to get full credit.

(b) Use the graphical method to compute the following:

$$f(0) = \lim_{x \to 0^{-}} f(x) = \lim_{x \to 0^{+}} f(x) = \lim_{x \to 0} f(x) =$$

(c) Circle all that apply: At x = 0, f(x) is:

left continuous right continuous continuous

3. Consider the piece-wise defined function

$$f(x) = \begin{cases} \frac{\sqrt{5-x}-2}{x-1}, & \text{if } x < 1\\ \frac{x}{4} - \frac{1}{2}, & \text{if } x \ge 1 \end{cases}$$

Without graphing, compute the following:

(a) f(1) =

(b)
$$\lim_{x \to 1^{-}} f(x) =$$

(c)
$$\lim_{x \to 1^+} f(x) =$$

(d)
$$\lim_{x \to 1} f(x) =$$

4. Use the **limit definition of the derivative** to compute the slope of the tangent line to the graph of $f(x) = \frac{1}{x-3}$ at x = 5.

5. Find the equation of the tangent line to the graph of $f(x) = 2x^2 - \frac{1}{\sqrt{x}}$ at x = 1. (Here, unlike in the preceding problem, you do not have to use the limit definition of the derivative.)