EXAM 1 - MATH 112 Friday, February 7

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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. Consider the function $f(x) = -x^2 - x + 6$.

   (a) Find the vertex.

   (b) Find the opening direction:

   (c) Find the y-intercept:

   (d) Find the x-intercepts.

   (e) Sketch the graph of $y = f(x)$ **labeling** all important points.

2. Compute the limit

$$\lim_{x \to 2} \left(\frac{x-2}{11x - x^2 - 18} \right) =$$

3. Consider the function $f(x) = \begin{cases} x^2 + 2, & \text{if } x < 1 \\ 6, & \text{if } x = 1 \\ \dfrac{x^2 + 7x - 8}{2x^2 - x - 1}, & \text{if } x > 1 \end{cases}$. Calculate:

   (a) $f(1) =$

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

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

4. The revenue function for selling x units of a commodity is $R(x) = \sqrt{3x + 7}$. Use the **limit definition of the derivative** to find the marginal revenue when $x = 6$ units are sold.

5. Find an equation for the tangent line to the graph of $f(x) = \dfrac{16}{\sqrt{x}} + 6\sqrt{x^3} - 8x$ at $x = 4$.