EXAM 1 - MATH 112 Friday, February 1

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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 $f(x) = -x^2 + 6x - 5$. Answer the following questions about f.

   (a) Find the vertex.

   (b) Give the opening direction.

   (c) Find the y-intercept.

   (d) Find the x-intercepts.

   (e) Sketch the graph.

2. Sketch the graph of the function $f(x) = \begin{cases} -2x+1, & \text{if } x < 1 \\ -x^2+6x-5, & \text{if } x \geq 1 \end{cases}$

(**Hint**: Use the graph from Problem 1.)

$f(1) =$

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

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

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

3. Find the difference quotient of the function $f(x) = \sqrt{5x+1}$ at $x = 3$.

4. Compute the following limits:

(a) $\lim_{x\to -7} \dfrac{x^2+4x-21}{x^2+8x+7} =$

(b) $\lim_{x\to 2} \dfrac{\frac{1}{x+5}-\frac{1}{7}}{x-2} =$

5. Consider the piece-wise defined function

$$f(x) = \begin{cases} \dfrac{x^2-9}{x+3}, & \text{if } x < -3 \\ -2, & \text{if } x = -3 \\ \dfrac{\sqrt{3-2x}-3}{x+3}, & \text{if } x > -3 \end{cases}$$

Compute the following:

(a) $\lim_{x\to -3^-} f(x) =$

(b) $f(-3) =$

(c) $\lim_{x\to -3^+} f(x) =$

(d) State the type of continuity that $f(x)$ has at $x = -3$ (if any).