Math 1300-005 - Spring 2017

Midterm 1 Review (In Class) - 2/6/17

Guidelines: Please work in groups of two or three. Combining this review, quizzes 2 and 3, and the worksheets from the second and third weeks will give you a very close approximation to what is on Midterm 1.

1. Use the *limit definition* of the derivative to find $f'(1)$ for the following function. (No credit will be given on the midterm if the definition is not used.)

   (a) $f(x) = x^2 - 3x + 1$

   (b) $f(x) = \dfrac{5}{x+3}$

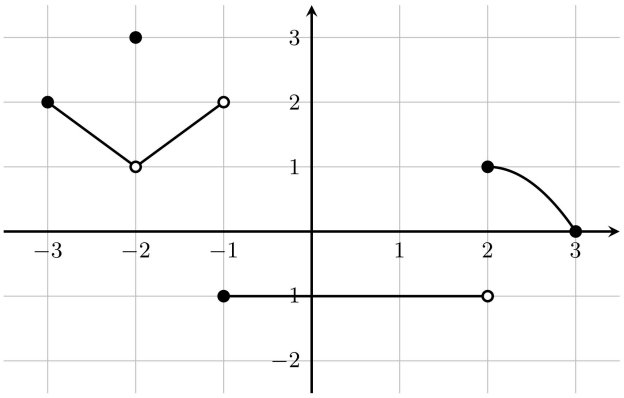
2. For each of the functions above, write the equation of the tangent line at $x = 1$.

   (a) Equation of the tangent line to $f(x) = x^2 - 3x + 1$ at $x = 1$:

   (b) Equation of the tangent line to $f(x) = 5/(x+3)$ at $x = 1$:

3. Use the graph of f and the formula for g to compute the given limits.

Graph of $f(x)$



$$g(x) = \begin{cases} x^2 - 2 & \text{if } x \leq 1 \\ x + 3 & \text{if } x > 1 \end{cases}$$

(a) $\lim_{x \to 0} \left[\dfrac{f(x)}{g(x)} \right]$

(b) $\lim_{x \to -2} g(f(x))$ [Think about HOW $f(x)$ approaches its limit as $x \to -2$, then look at the appropriate piece of $g(x)$.]

(c) $\lim_{x \to -1} \big(f(x) + g(x) \big)$ [Compute the RHL and LHL and see if they are equal.]

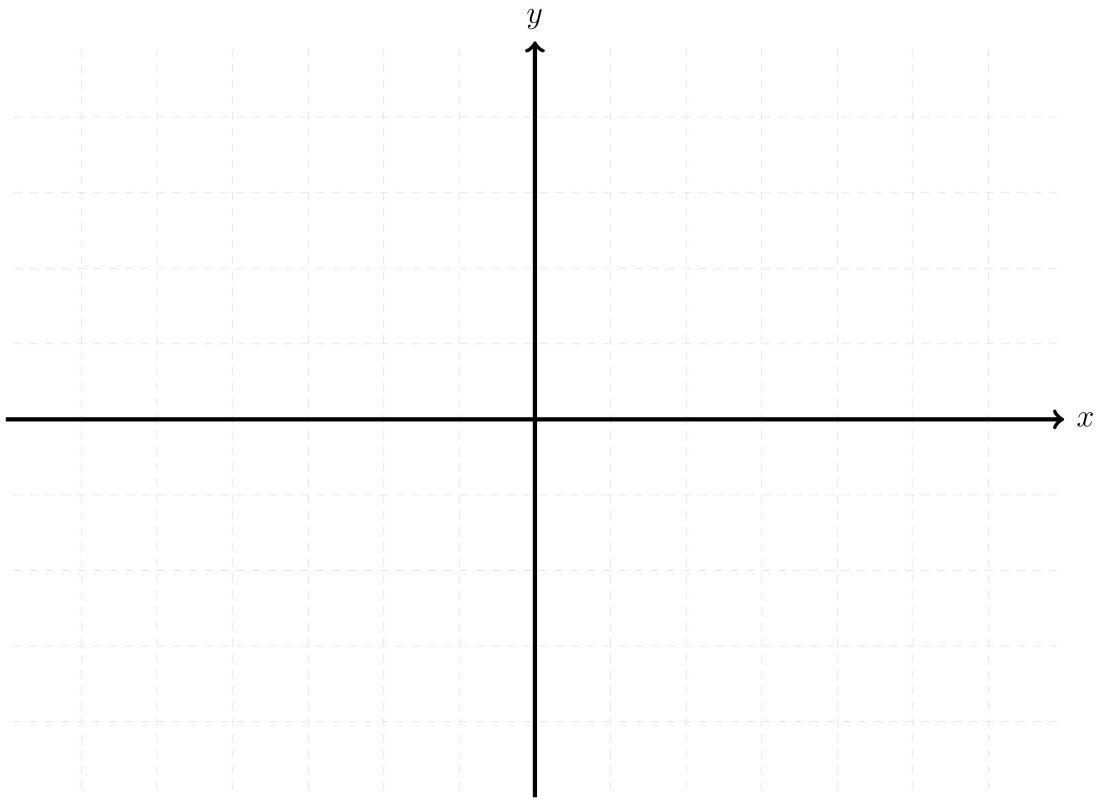
4. State the mathematical definition of what it means for a function $f(x)$ to be continuous at $x = a$.

5. Compute the limit.

$$\lim_{x \to -2} \frac{|x+2|}{x+2}$$

6. Sketch the graph of an example of a function f that satisfies

$$\lim_{x \to -4} f(x) = 1, \quad \lim_{x \to -3^+} f(x) = -4, \quad \lim_{x \to 1} f(x) \text{ DNE},$$
$$\lim_{x \to 3} f(x) = \infty, \quad \lim_{x \to \infty} f(x) = 1.$$



7. Compute the limit.

$$\lim_{x \to 7} \frac{\sqrt{x+9} - 4}{x - 7}$$

8. A woman goes for a morning run. The function $s(t)$ gives the distance in feet she has traveled after t seconds.

t in seconds	0	1	2	3	4	5	6
$s(t)$ in feet	0	7	18	31	42	54	67

(a) Compute the average velocity of the woman over the following time intervals. Be sure to include units.

i. $[2, 3]$

ii. $[3, 4]$

(b) Estimate the instantaneous velocity at $t = 3$. Be sure to include units.

(c) Assume $s'(4) = 12$. What does the value 12 represent in the context of the problem?