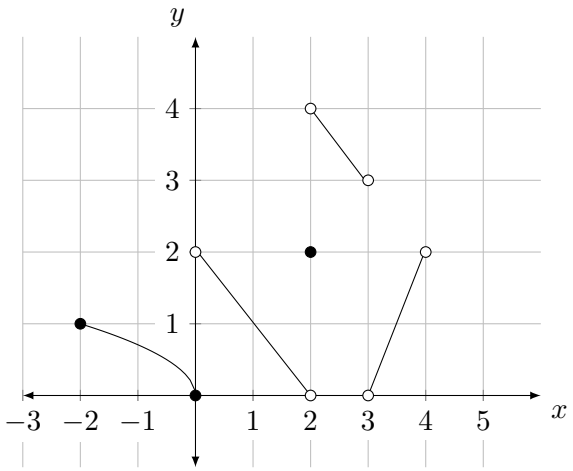
Name: _____ Mark: _____

Mini-math Div 3/4: Friday, September 17, 2021 (15 minutes)

1. Consider the below graph of a function $g(x)$, which consists of straight line segments.



Graph of g

(a) (1 point) Determine $\lim_{x \to 2} g(x)$, if it exists. If it does not, explain why it does not.

(b) (1 point) (AP) Determine $\lim_{x \to 2} g(g(x))$, if it exists. If it does not, explain why it does not.

2. (1 point) True or false: The value of $\lim_{x \to a} f(x)$ is $f(a)$, assuming $f(a)$ is defined.

3. (1 point) True or false: $\lim_{x \to a} f(x)$ can only exist if the left and right limits exist and are equal.

4. What method would you use to solve the following limits?

   (a) (1 point) $\lim_{h \to 0} \dfrac{(3+h)^2 - 9}{h}$?

   (b) (1 point) $\lim_{x \to 4} \dfrac{\sqrt{8-x} - 2}{1 - \sqrt{5-x}}$

   (c) (1 point) $\lim_{x \to 1} \dfrac{x^2 + 5x + 6}{x^2 - 5x + 6}$

   (d) (1 point) $\lim_{x \to -4} \dfrac{x^2 + 3x - 4}{x|x+4|}$

5. (1 point) (AP) Suppose $g(x) \leq f(x) \leq h(x)$ for all x except for $x = a$. What additional conditions are necessary to guarantee that $\lim_{x \to a} f(x)$ exists?

6. (3 points) Where is the following function discontinuous? Identify the type of discontinuity, if any.

$$f(x) = \begin{cases} \dfrac{6}{x+3} & \text{if } x < 0 \\ 3 & \text{if } x = 0 \\ x + 2 & \text{if } x > 0 \end{cases}$$