

# Study Guide, sections 2.1 – 2.5 Limits

Name:

*Non-Calculator Section*

Sketch a graph of the function  $g(x)$  that has these limits:

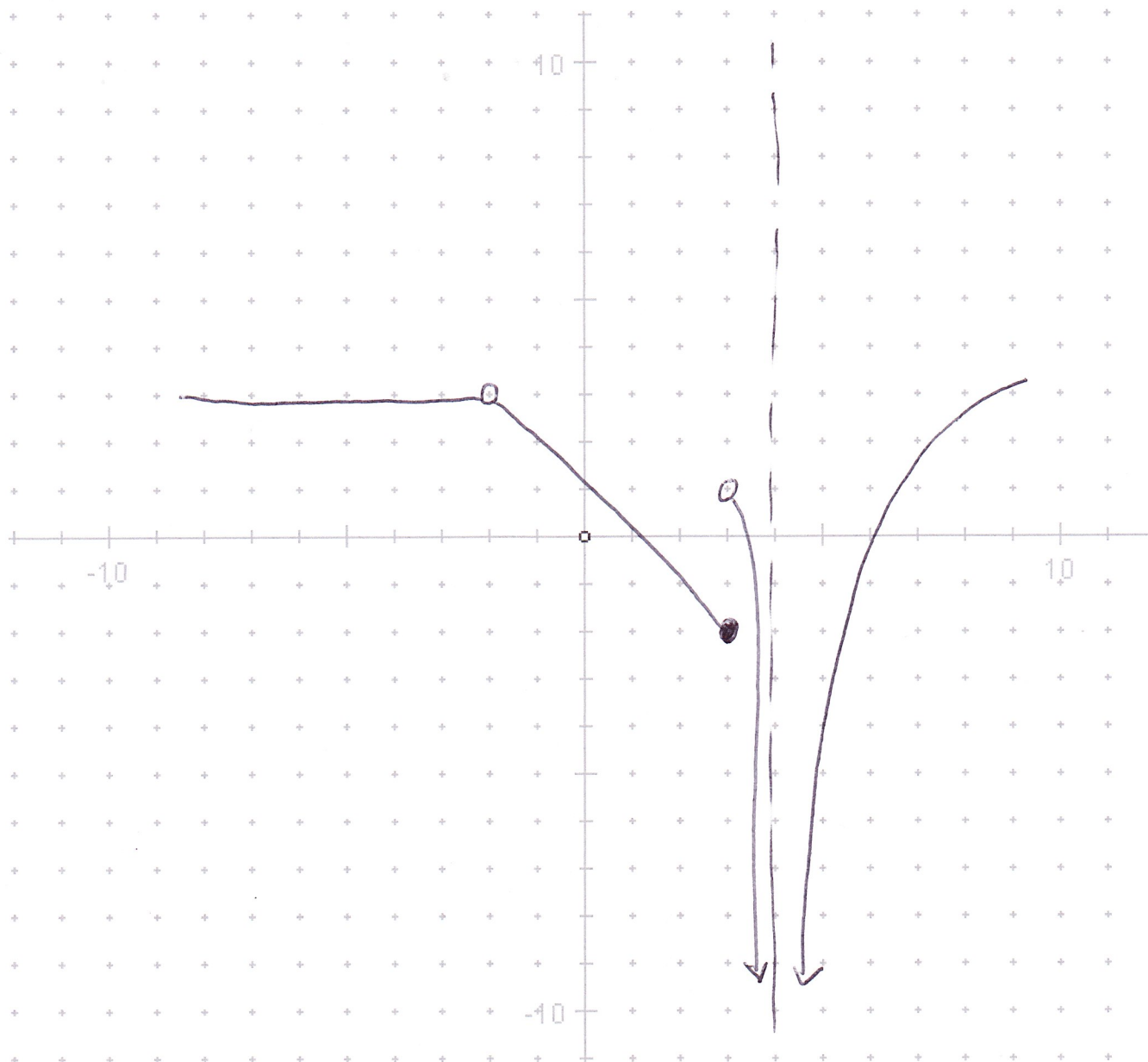
$$\lim_{x \rightarrow 3^+} f(x) = 1$$

$$\lim_{x \rightarrow 3^-} f(x) = -2$$

$$\lim_{x \rightarrow 4^+} f(x) = -\infty$$

$$\lim_{x \rightarrow 4^-} f(x) = -\infty$$

$$\lim_{x \rightarrow -2} f(x) = 3$$



Find the limits.

$$\lim_{x \rightarrow 5} \frac{x-5}{\sqrt{x}-\sqrt{5}} \quad \frac{0}{0} \quad = \frac{\sqrt{x}+\sqrt{5}}{\sqrt{x}+\sqrt{5}} = \frac{(x-5)(\sqrt{x}+\sqrt{5})}{x-5} \rightarrow \sqrt{5}+\sqrt{5}$$

answer:  $2\sqrt{5}$

$$\lim_{x \rightarrow 3} \frac{x^2-16}{x^2+6x-16} \quad \frac{-7}{9+18-16} \quad = \quad \frac{-7}{11}$$

answer:  $-7/11$

$$\lim_{x \rightarrow 2} \frac{x^2-16}{x^2+6x-16} \quad \frac{4-16}{4+12-16} \quad = \quad \frac{-12}{0}$$

answer: DNE or  $\infty$

$$\lim_{x \rightarrow 0} \frac{\cot x}{\csc x} \quad \frac{\frac{\cos x}{\sin x}}{\frac{1}{\sin x}} = \cos x$$

answer: 1

$$\lim_{x \rightarrow 2} \frac{1}{x-2} - \frac{7}{x^2+3x-10} \quad \frac{1}{0} - \frac{7}{0} \quad \infty - \infty \quad ?$$

$$\frac{x+5}{(x-2)(x+5)} - \frac{7}{(x-2)(x+5)} = \frac{x-2}{(x-2)(x+5)} = \frac{1}{x+5} \rightarrow \frac{1}{7}$$

answer: 1/7

Given the piecewise-defined function:

$$\begin{cases} y = -0.5x - 1, & x \leq -4 \\ y = ax^2 - 3, & x > -4 \end{cases}$$

if the function is to be continuous, what is the value of a?

$$\begin{aligned} -0.5(-4) - 1 &= 16a - 3 \\ 2 - 1 &= 16a - 3 \\ 4 &= 16a \\ a &= 1/4 \end{aligned}$$

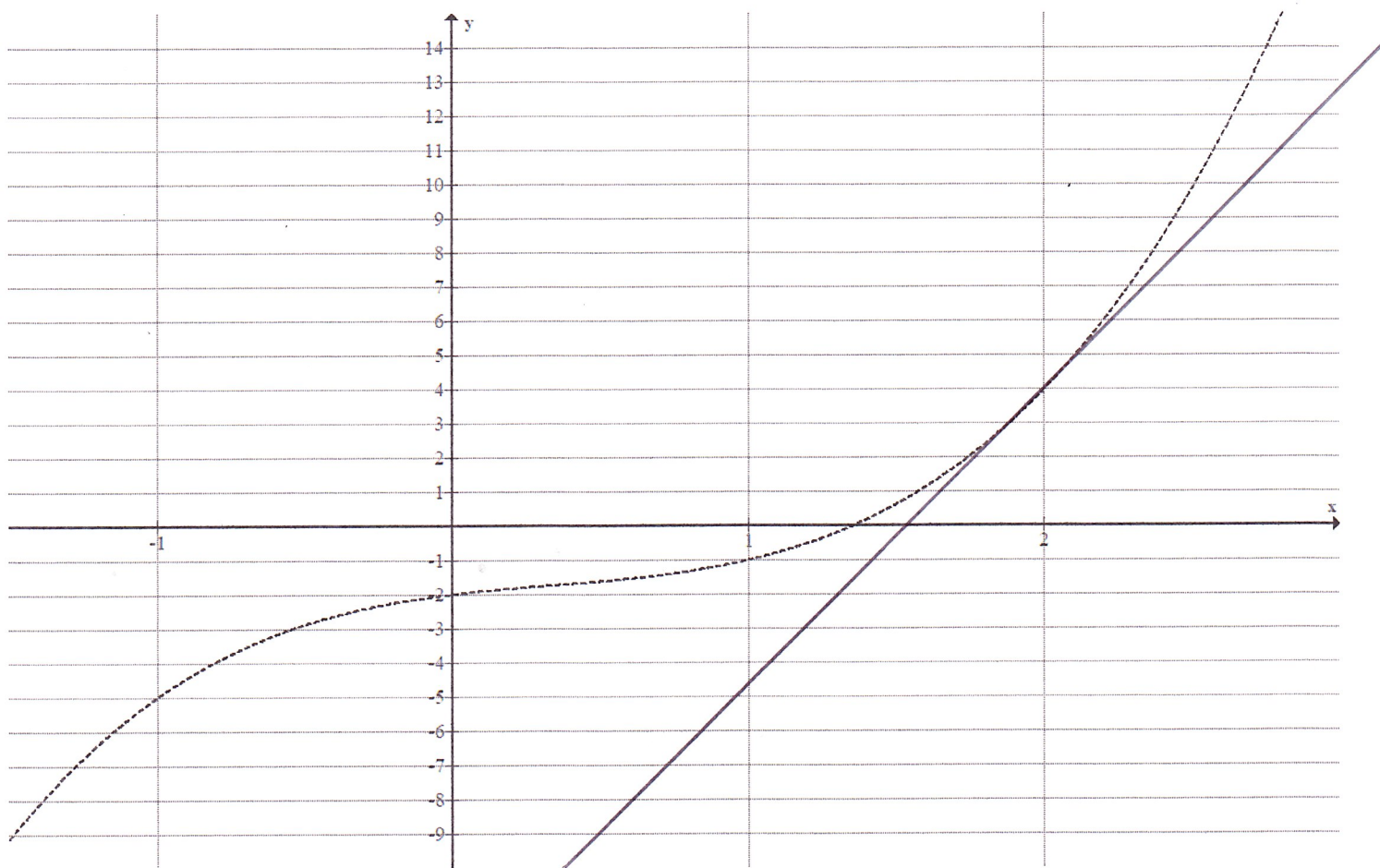
answer: \_\_\_\_\_

Determine the point(s) at which the function is not continuous and state the type of discontinuity.

$$f(x) = \frac{x^2+x-6}{x-2} = \frac{(x+3)(x-2)}{x-2}$$

answer: removable discontinuity  
at  $x = 2$

Calculator-Active Section



Given the graph above, find the average ROC of the function on the x-interval  $[0, 2]$ .

$$(0, -2) \quad (2, 4)$$

$$\frac{4 - (-2)}{2 - 0} = \frac{6}{2} = 3$$

Graphically estimate the instantaneous ROC of the function at  $x = 2$ .

$$(2, 4) \quad (1.5, 0)$$

$$\frac{4 - 0}{2 - 1.5} = 8$$

Estimate the limit:

$$\lim_{x \rightarrow 0} f(x) \text{ where } f(x) = \frac{2^x - x - 1}{x}$$

$$\frac{2^0 - 0 - 1}{0} = \frac{0}{0}$$

use calculator

answer: -0.3068