

TOPIC: CONTINUITY

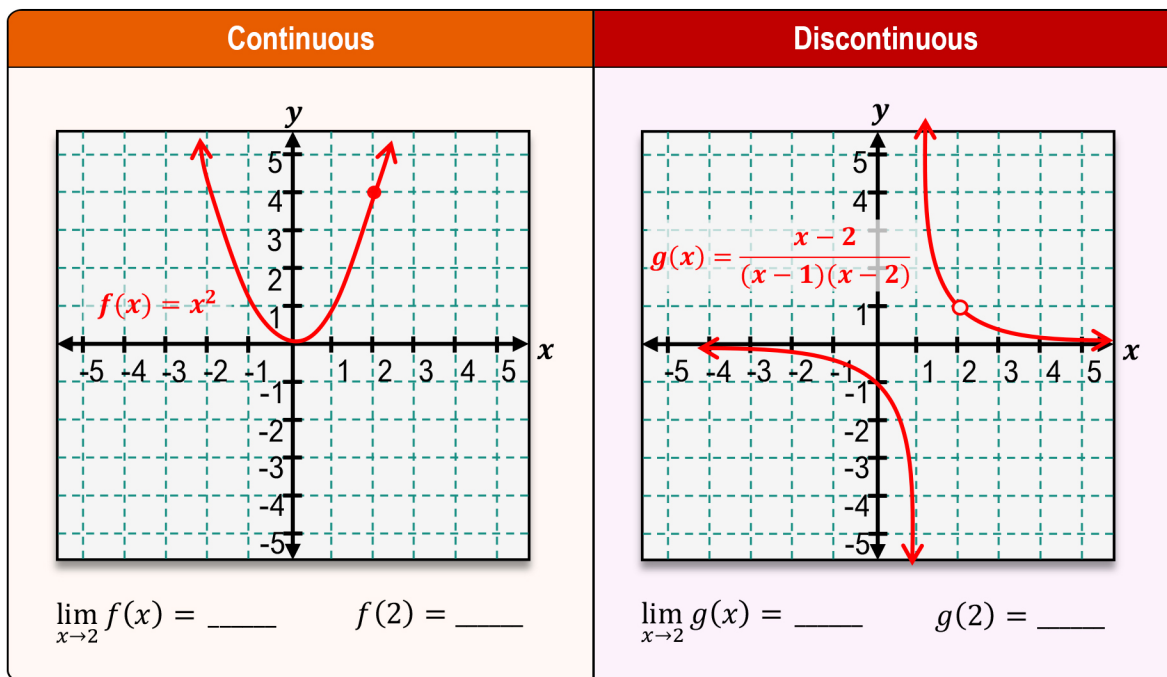
Intro to Continuity

◆ A function is **continuous** at c if the limit as $x \rightarrow c$ is the _____ as the function value.

$$\lim_{x \rightarrow c} f(x) = f(c)$$

► Graphically, if you can trace through a point without stopping, the fcn is continuous there.

(Continuous)



◆ **Discontinuities** occur when a function has a _____, _____, or _____.

EXAMPLE

Determine if the function is continuous at each given value of c by finding $f(c)$ & $\lim_{x \rightarrow c} f(x)$.

(A) $c = -2$ $\lim_{x \rightarrow -2} f(x) = \underline{\hspace{2cm}} \quad f(-2) = \underline{\hspace{2cm}}$

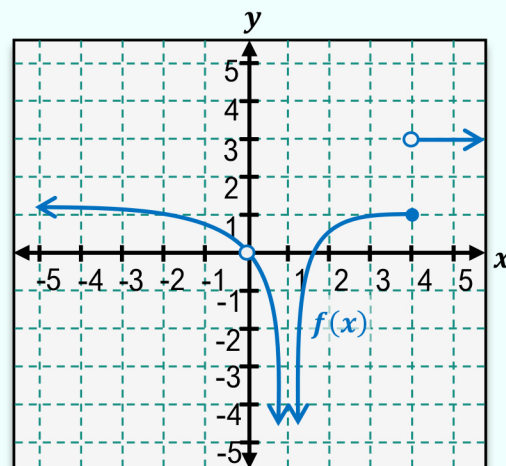
[CONTINUOUS | DISCONTINUOUS]

(B) $c = 4$ $\lim_{x \rightarrow 4} f(x) = \underline{\hspace{2cm}} \quad f(4) = \underline{\hspace{2cm}}$

[CONTINUOUS | DISCONTINUOUS]

(C) $c = 1$ $\lim_{x \rightarrow 1} f(x) = \underline{\hspace{2cm}} \quad f(1) = \underline{\hspace{2cm}}$

[CONTINUOUS | DISCONTINUOUS]



TOPIC: CONTINUITY

PRACTICE

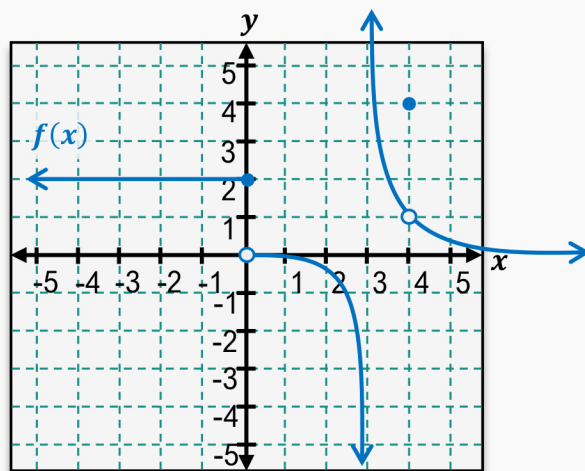
Use the graph of $f(x)$ to determine if the function is continuous or discontinuous at $x = c$.

(A) $c = 0$

(B) $c = -2$

(C) $c = 3$

(D) $c = 4$



TOPIC: CONTINUITY

Determine Continuity Algebraically

- ◆ Recall: Discontinuities occur when a function has a jump, hole, or asymptote (where denom. ____ for rational fcn's).
 - For piecewise functions, compare the limit & function value for the _____(s) between each "piece."

EXAMPLE

Determine the value(s) of x (if any) for which the function is discontinuous.

$$\lim_{x \rightarrow c} f(x) = f(c)$$

(A)

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

(B)

$$f(x) = \begin{cases} 4 & \text{for } x < -1 \\ x + 1 & \text{for } x \geq -1 \end{cases}$$

TOPIC: CONTINUITY

EXAMPLE

Determine the value(s) of x (if any) for which the function is discontinuous.

$$f(x) = \frac{x - 3}{x^2 + 2x - 15}$$

PRACTICE

Determine the value(s) of x (if any) for which the function is discontinuous.

$$f(x) = \frac{x - 4}{x^2 - x - 12}$$

TOPIC: CONTINUITY

EXAMPLE

Determine the value(s) of x (if any) for which the function is discontinuous.

$$f(x) = \begin{cases} 5 & \text{for } x < -2 \\ x^2 + 2x + 1 & \text{for } -2 \leq x \leq 0 \\ x + 1 & \text{for } x > 0 \end{cases}$$

PRACTICE

Determine the value(s) of x (if any) for which the function is discontinuous.

$$f(x) = \begin{cases} 3x^2 + 4x + 5 & \text{for } x < -1 \\ 4 & \text{for } x \geq -1 \end{cases}$$