1.5 Piecewise Functions:

I can...

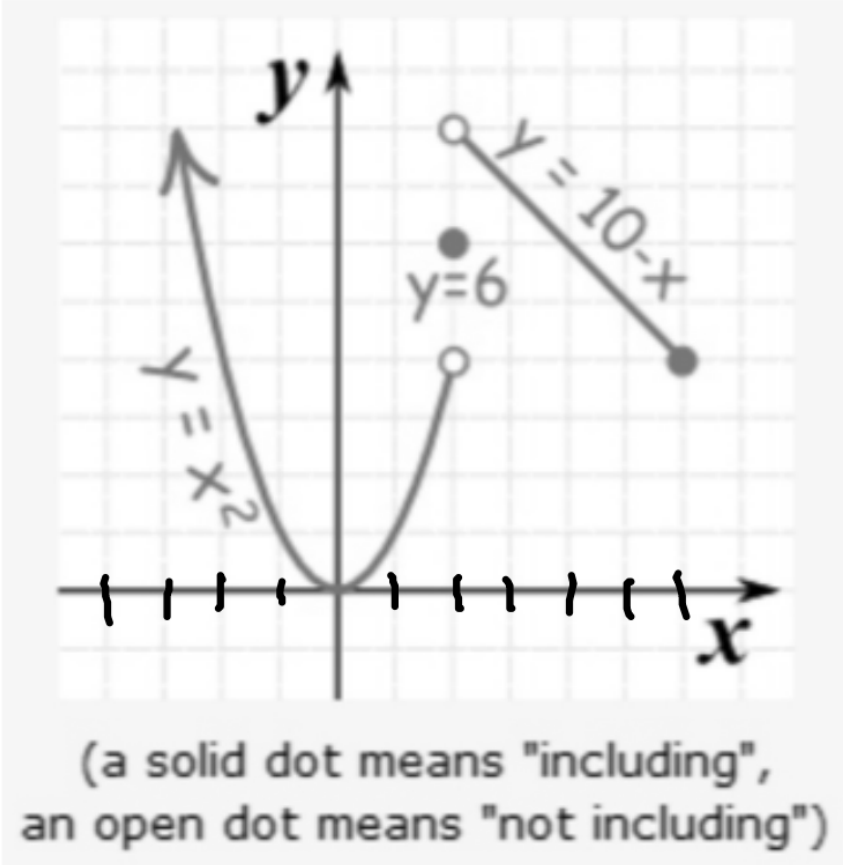
1. Evaluate and graph piecewise functions.
2. Determine constants that would make a piecewise function continuous.

Why?

Piecewise functions are used to represent data in many different fields in the real world, such as in businesses & government agencies.

1.5 Piecewise Functions

Piecewise function: a function that is composed of 2 or more equations over a specified domain

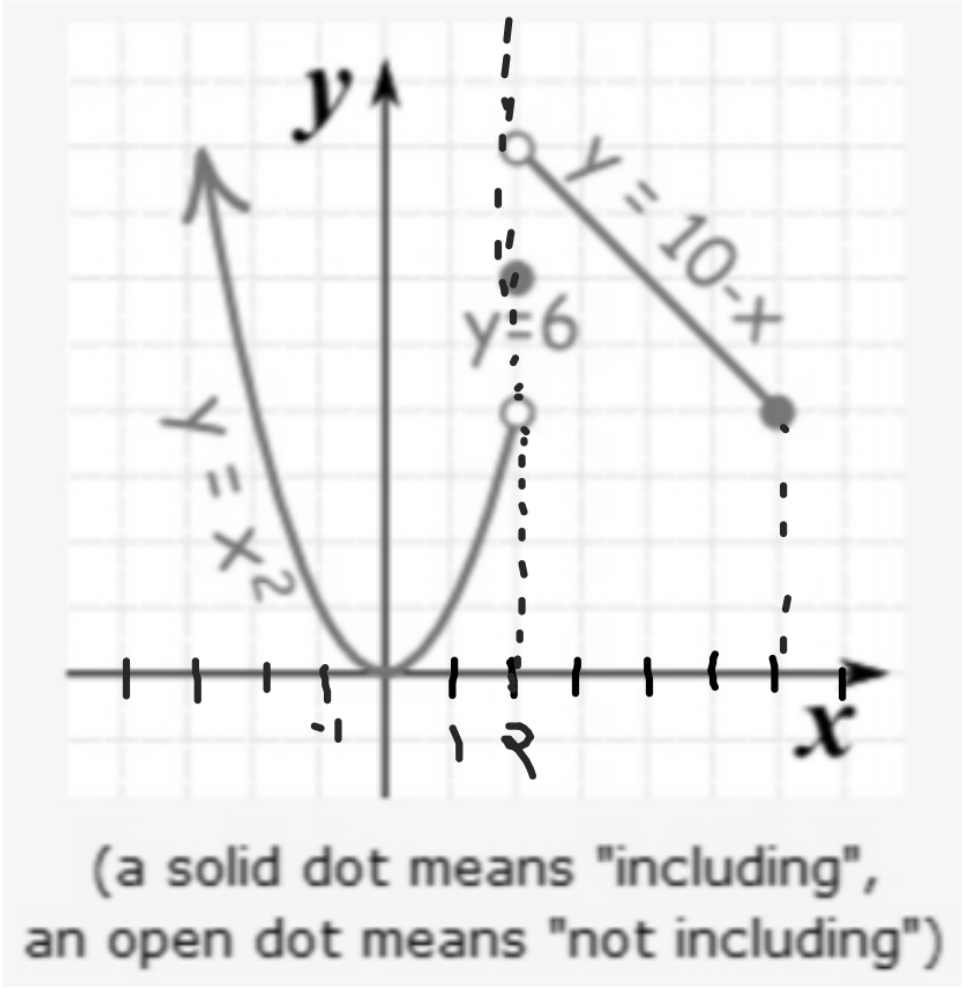


(a solid dot means "including",
an open dot means "not including")

• closed . ≤ ≥ [

o open > < (

How would you write a function equation for the graph below using appropriate domain restrictions?



(a solid dot means "including", an open dot means "not including")

$$f(x) = \begin{cases} x^2, & x < \\ 6, & x = \\ 10 - x, & 2 \end{cases}$$

Evaluating Piecewise Functions

Ex 1: Evaluate the function at each specified value of the independent variable & simplify.

$$f(x) = \begin{cases} 5 - 2x, & x < 0 \\ 5, & 0 \le x < 1 \\ 4x + 1, & x \ge 1 \end{cases}$$

0

$-2 < 0$? yes

$0 \le .5 < 1$? y

a. f(-2) = $5 - 2(-2) = 9$

b. f(0.5) = 5

c. f(1) = $4(1) + 1 = 5$

Graphing Piecewise Functions

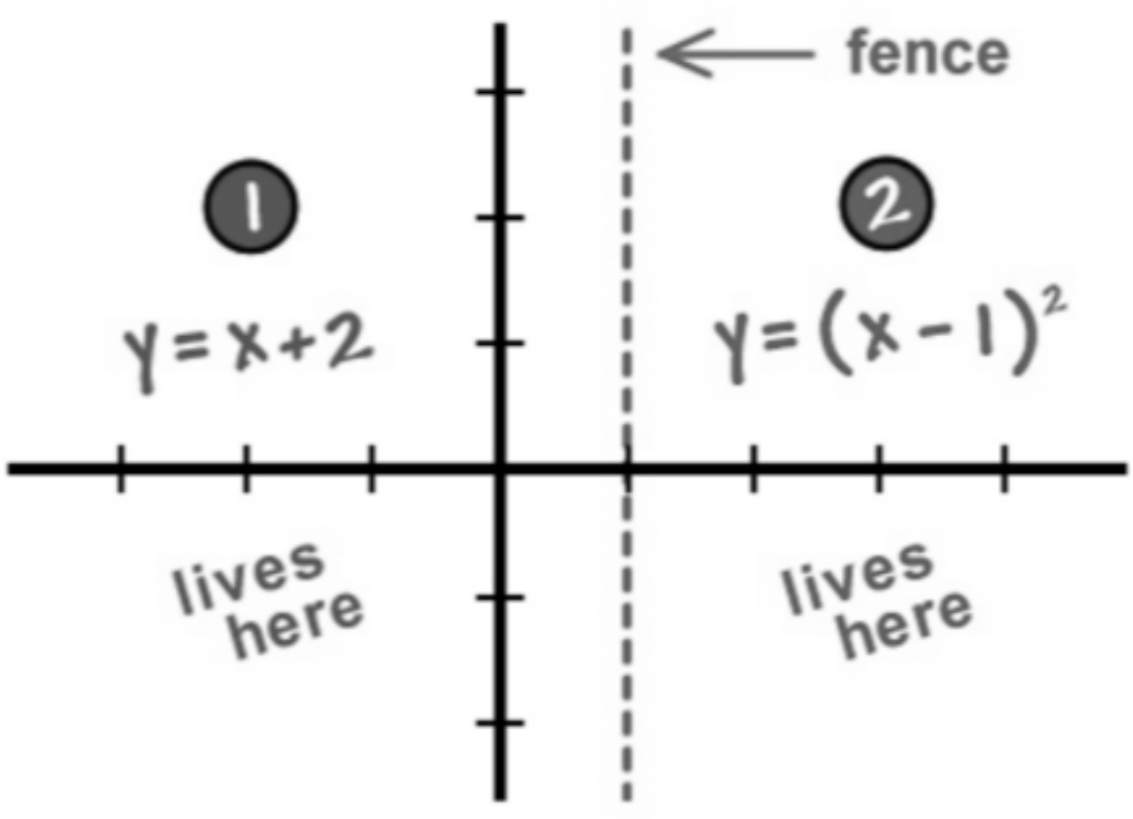
Ex 2: Graph by hand

Pick 2 colors!

$$y = \begin{cases} x+2 & ; x < 1 \leftarrow (1) \\ (x-1)^2 & ; x \geq 1 \leftarrow (2) \end{cases}$$

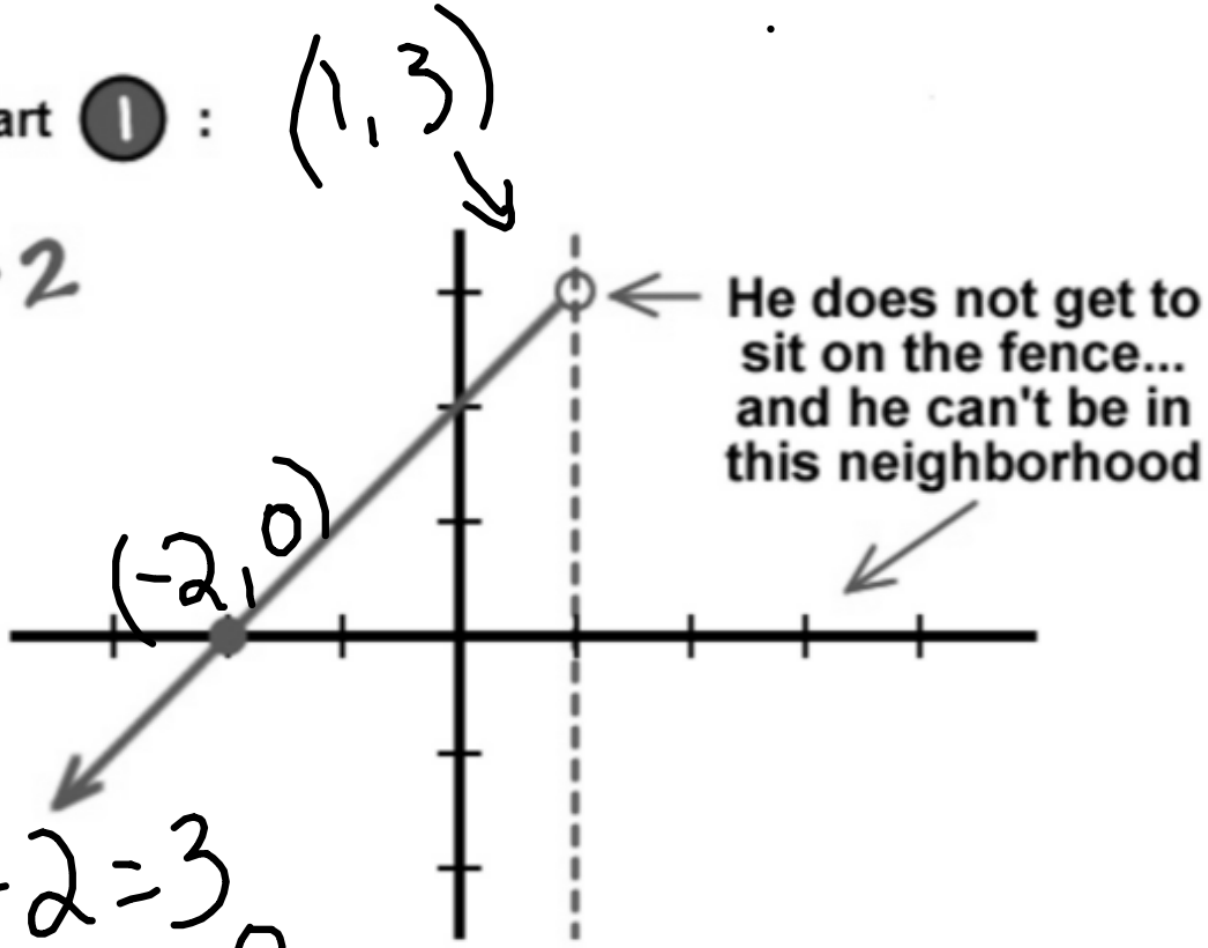
It's in two pieces!

*Each piece must live ONLY in its own neighborhood
*Identify where the dividing fence(s) is/are


fence
1
2
y = x + 2
y = (x - 1)²
lives here
lives here

Let's graph part 1 :

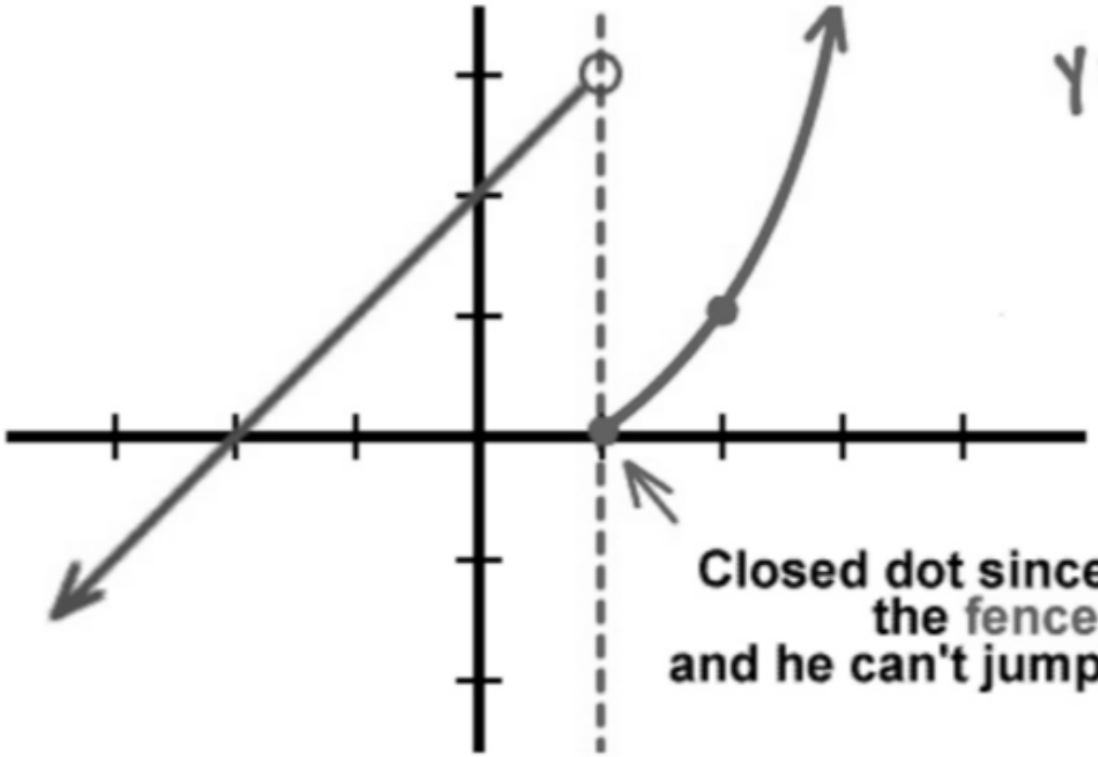
$y = x + 2$



$y = (1) + 2 = 3$

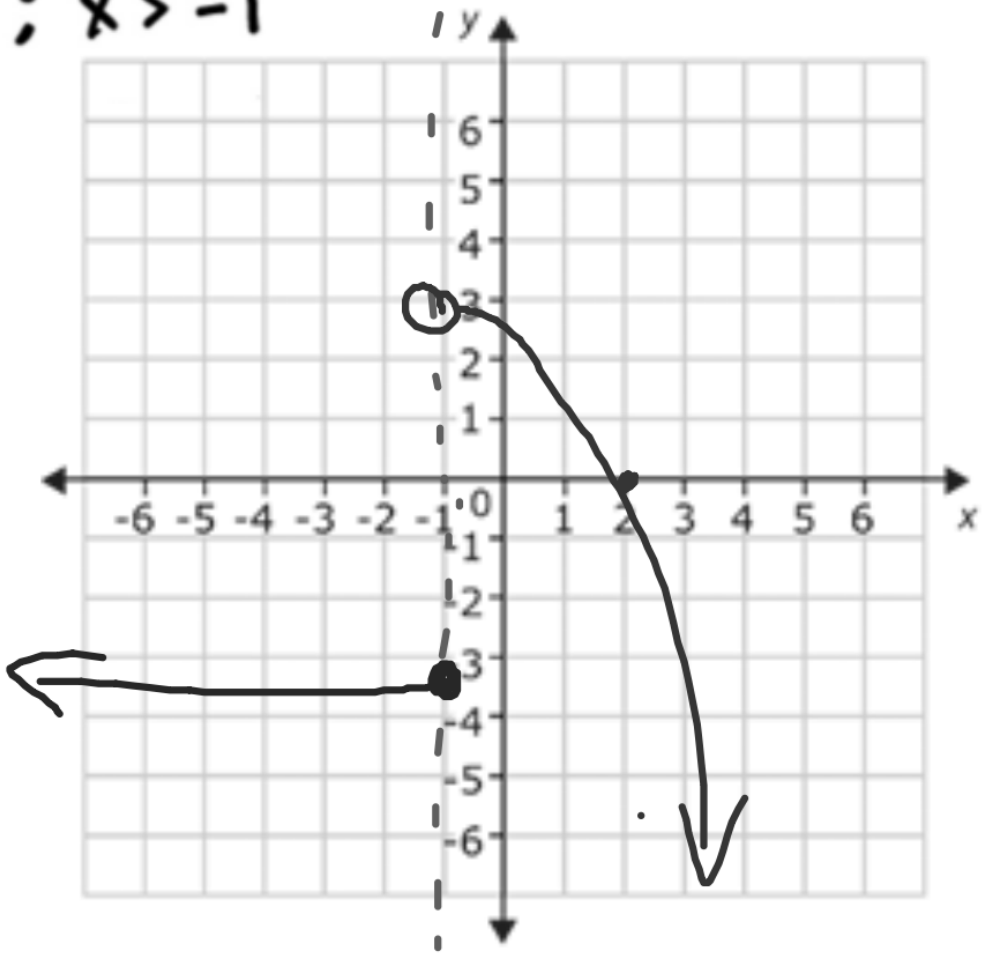
$y = (-2) + 2 = 0$

Now, let's graph part 2 :



Ex 3: Graph by hand

$$y = \begin{cases} -3 & ; x \leq -1 \\ -x^2 + 4 & ; x > -1 \end{cases}$$



arm-up

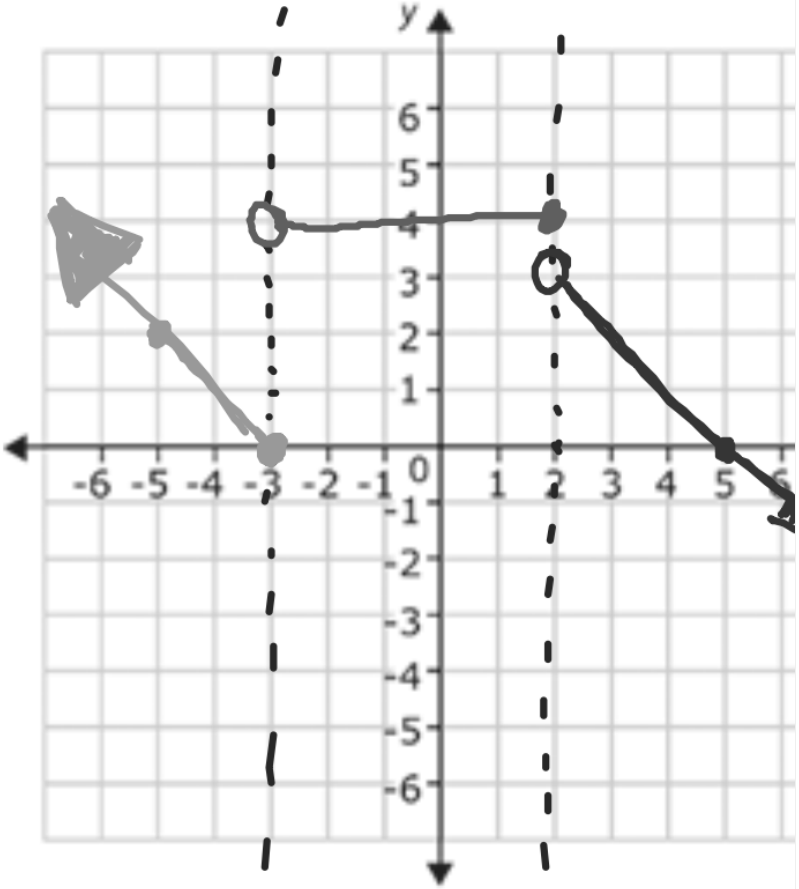
$$y = \begin{cases} |x+3| ; x \leq -3 & \leftarrow 1 \\ 4 ; -3 < x \leq 2 & \leftarrow 2 \\ 5-x ; x > 2 & \leftarrow 3 \end{cases}$$

1. Find f(-4) + 2f(0) - f(3)

$1 + 2(4) - 2 = 7$

2. Graph by hand

Complete on graph paper



Ex 5: Is there a value of k that will make the following piecewise function continuous at x = 3?

$$f(x) = \begin{cases} k\sqrt{x+1}, & 0 \le x \le 3 \\ 5 - x, & 3 < x \le 5 \end{cases}$$

a) Which part of the graph (top or bottom piece) is changed when k is changed? How does the graph change?

b) Do you think there is a value of k for which the two pieces of the graph will "match" at x = 3?

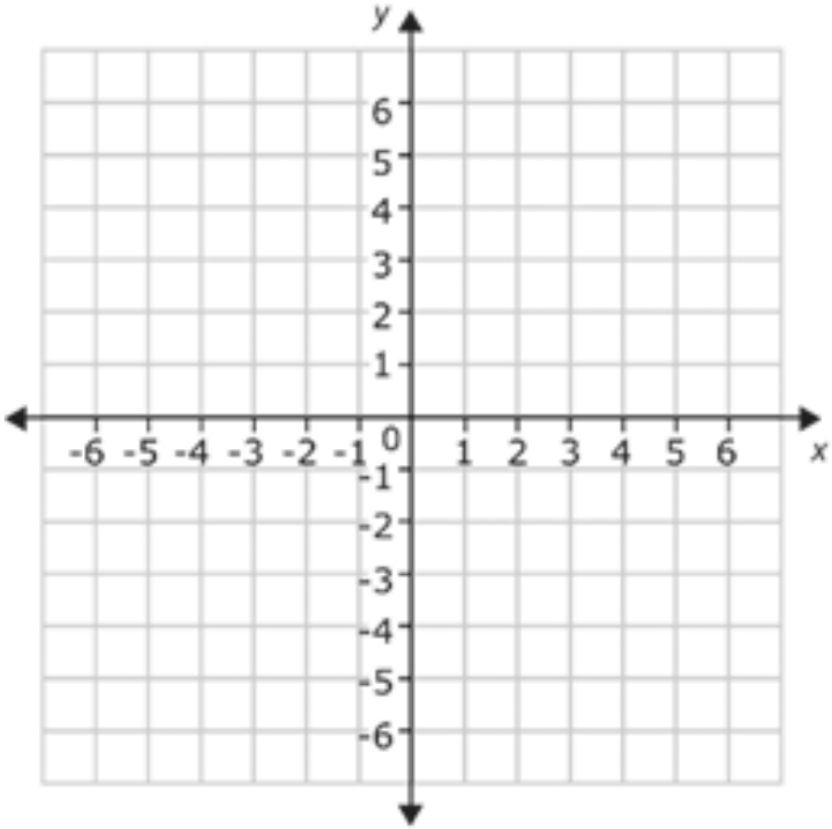
c) If there is such a value of k, what must be true about the value of f(x) (or y) of both pieces at x = 3?

Big Takeaway: The continuity of a piecewise function requires that the pieces of the graph fit together (or match) at the specific domain value in question.

Ex 6: What value of *k* will make f(x) continuous?

$$f(x)=\begin{cases} x^2-2x-3, x\neq 2 \\ k-3, x=2 \end{cases}$$

1.9, 1.9



$x^2-2x-3=k-3$

$(2)^2-2(2)-3=k-3$

$4-4-3=k-3$

$-3=k-3$

$0=k$

Ex 7 What value of *k* will make f(x) continuous?

a. $$f(x)=\begin{cases}4x-11, & x<3\\ kx^2, & x\geq 3\end{cases}$$

$4x-11 = kx^2$

$4(3)-11 = k\cdot 9$

$= 9k$

b. $$f(x)=\begin{cases}kx^2, & x\leq 2\\ 2x+k, & x>2\end{cases}$$

Piecewise Function Practice

Think Tank

HINT: there is MORE than 1 way to do this problem!

Exit Ticket