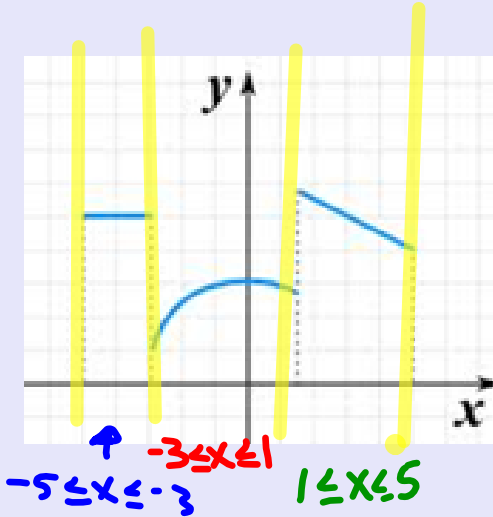
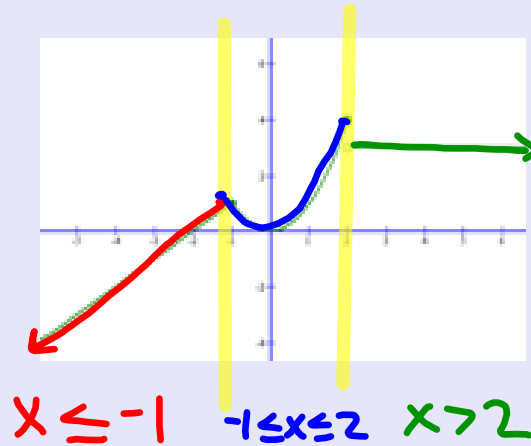
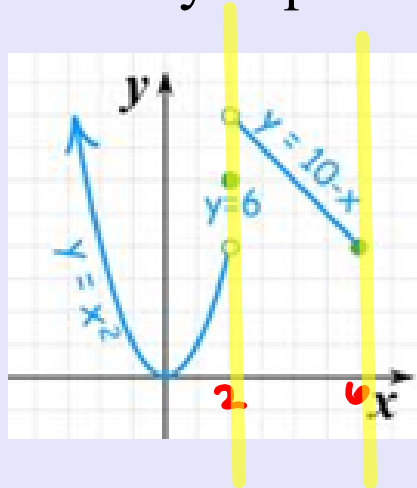


Algebra 2

Piecewise Functions

A **piecewise function** has different rules for different parts of its domain. A piecewise function is a function that behaves differently depending on the input (x) value.



● means "including"

○ means "nonincluding"

Evaluate:

$$f(x) = \begin{cases} x-2, & x < 0 \\ x^2 + 1, & x \geq 0 \end{cases}$$

$$x = -4$$

$$a) f(-4) = -6$$

$$\begin{aligned} f(x) &= x - 2 \\ &= -4 - 2 \\ &= -6 \end{aligned}$$

$$x = 0$$

$$b) f(0) = 1$$

$$\begin{aligned} f(x) &= x^2 + 1 \\ &= (0)^2 + 1 \\ &= 1 \end{aligned}$$

$$x = 3$$

$$c) f(3) = 10$$

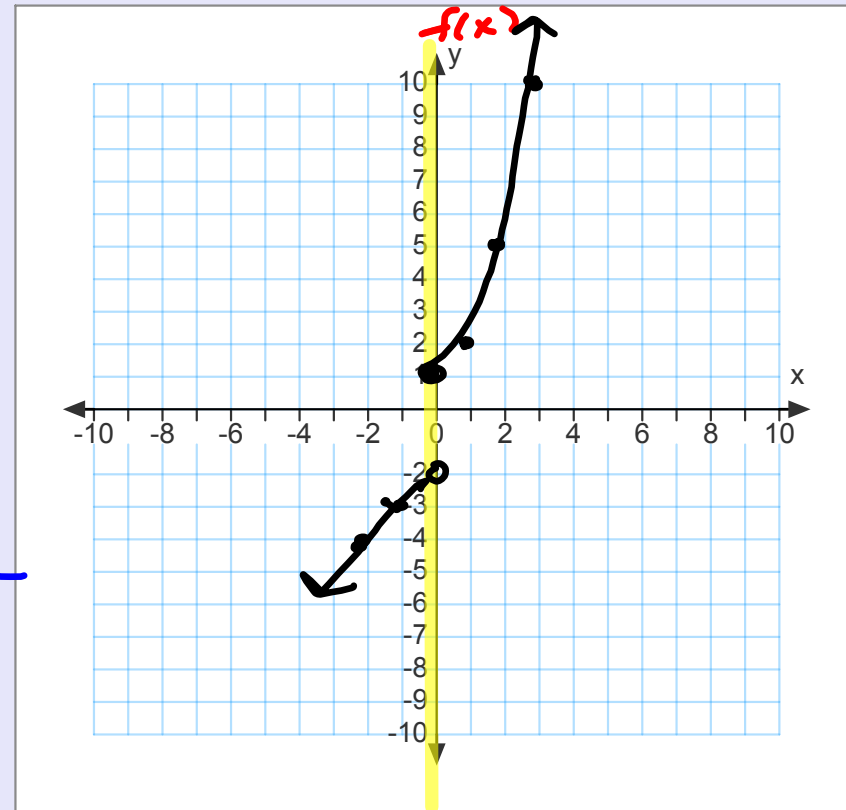
$$\begin{aligned} f(x) &= x^2 + 1 \\ &= (3)^2 + 1 \\ &= 10 \end{aligned}$$

Sketch

$$f(x) = \begin{cases} x-2, & x < 0 \\ x^2 + 1, & x \geq 0 \end{cases}$$

x	$f(x) = x - 2$	$f(x)$
0	$= 0 - 2$	-2
-1	$= -1 - 2$	-3
-2	$= -2 - 2$	-4

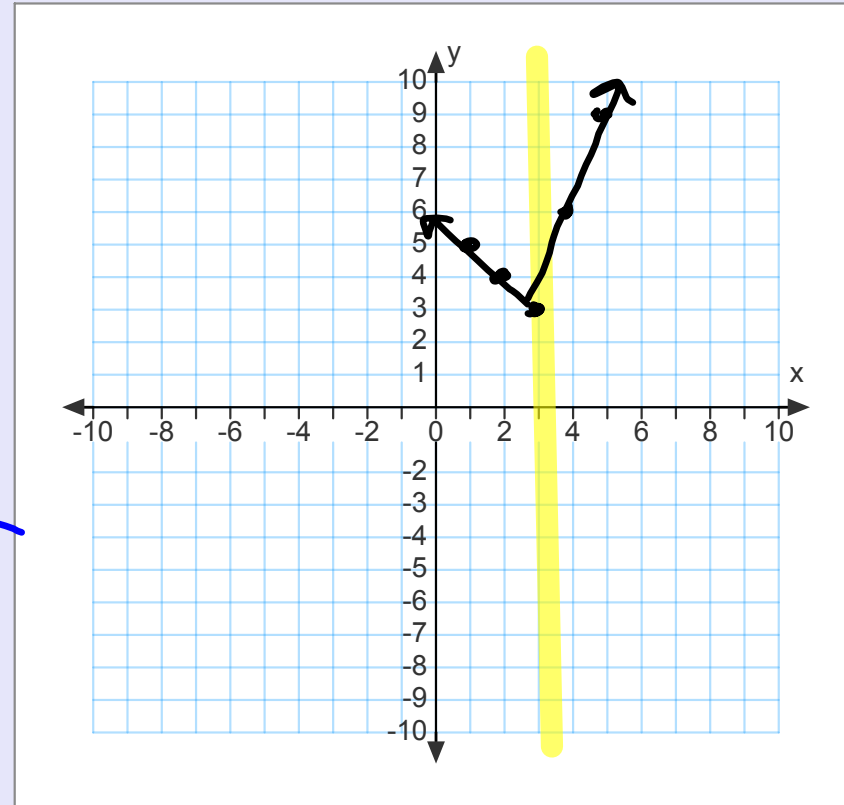
x	$f(x) = x^2 + 1$	$f(x)$
0	$= 0^2 + 1$	1
1	$= 1^2 + 1$	2
2	$= 2^2 + 1$	5
3	$= 3^2 + 1$	10
4	$= 4^2 + 1$	17



$$f(x) = \begin{cases} 6 - x, & x \leq 3 \\ 3x - 6, & x > 3 \end{cases}$$

x	f(x) = 6 - x	f(x)
3	= 6 - 3	3
2	= 6 - 2	4
1	= 6 - 1	5

x	f(x) = 3x - 6	f(x)
3	= 3(3) - 6	3
4	= 3(4) - 6	6
5	= 3(5) - 6	9

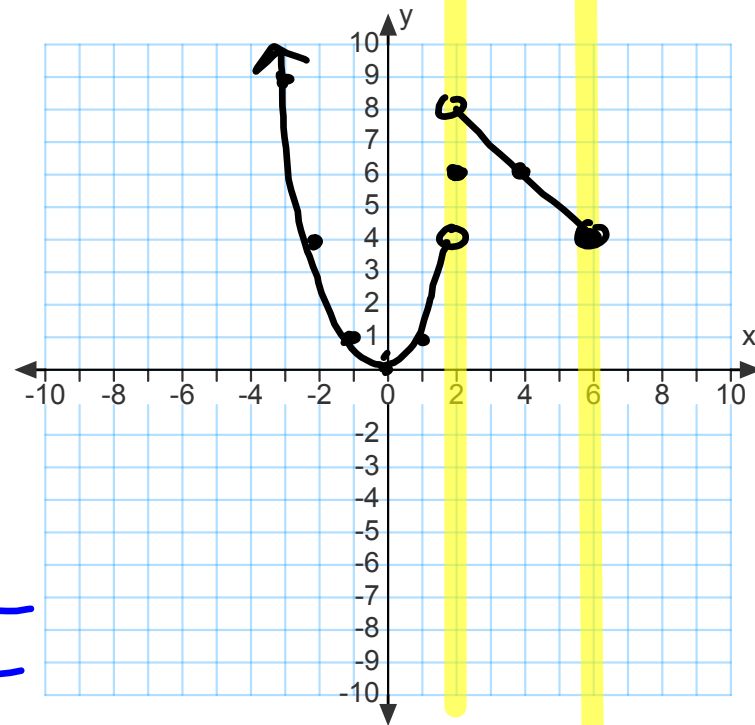


$$f(x) = \begin{cases} x^2, & x < 2 \\ 6, & x = 2 \\ 10 - x, & 2 < x \leq 6 \end{cases}$$

x	f(x) = x ²	f(x)
2	= 2 ²	4
1	= 1 ²	1
0	= 0 ²	0
-1	= (-1) ²	1
-2	= (-2) ²	4
-3	= (-3) ²	9

$$f(x) = 6 \quad (2, 6)$$

x	f(x) = 10 - x	f(x)
2	= 10 - 2	8
4	= 10 - 4	6
6	= 10 - 6	4



Write a piecewise function to represent the graph at the right.

Region where $x \leq -2$

$(-2, 2)$ $(-3, 3)$

$$m = \frac{3-2}{-3-(-2)} = \frac{1}{-1} = -1$$

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

$$y - 2 = -x - 2$$

$$y = -x$$

Region between $-2 < x < -1$

$(-2, -6)$ $(-1, -3)$

$$m = \frac{-3 - (-6)}{-1 - (-2)} = \frac{3}{1} = 3$$

$$y + 6 = 3(x + 2)$$

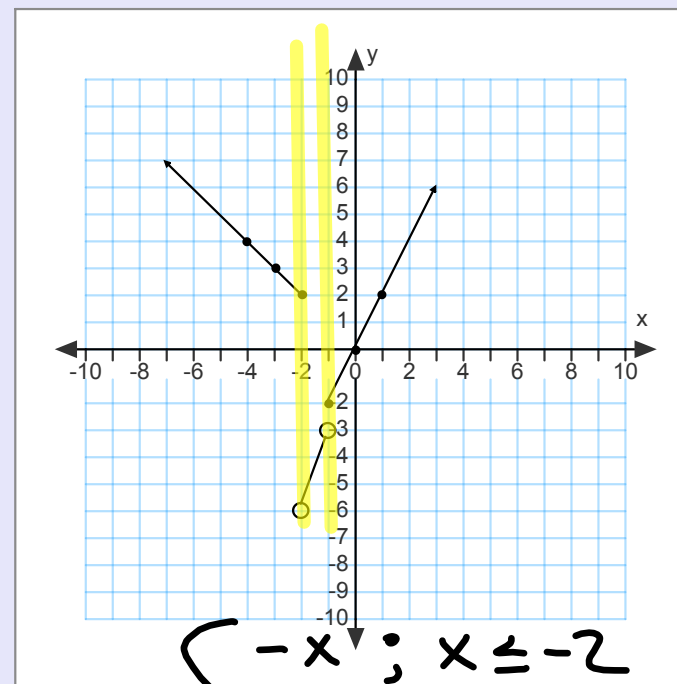
$$y + 6 = 3x + 6$$

$$y = 3x$$

Region $x \geq -1$

$(-1, -2)$ $(1, 2)$

$$m = \frac{2 - (-2)}{1 - (-1)} = \frac{4}{2} = 2$$



$$f(x) = \begin{cases} -x & ; x \leq -2 \\ 3x & ; -2 < x < -1 \\ 2x & ; x \geq -1 \end{cases}$$

$$\begin{aligned} y + 2 &= 2(x + 1) \\ y + 2 &= 2x + 2 \\ y &= 2x \end{aligned}$$

Massachusetts Speeding Fines

Miles per hour over Speed Limit	Fines
1-10	\$100 flat charge
11 or more	\$100 flat charge plus \$10 for each additional mph above the first 10 mph

$$f(x) = \begin{cases} 100 & ; 1 \leq x \leq 10 \\ 100 + 10(x - 10) & ; x \geq 11 \end{cases}$$