

Solving equations and inequalities from a graph

Suppose that f defines y as a function of x and that C is a real number. Then every value of x in the domain of f is a solution to exactly one of the following.

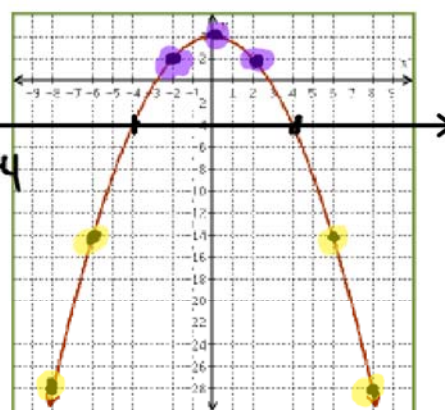
$$f(x) = C \text{ or } f(x) < C \text{ or } f(x) > C$$

Example 1

Complete Table 1 with the corresponding function values (they are all integers). Then indicate which of the three options the x -coordinate satisfies.

Table 1

x	$f(x)$	$f(x) > -4$	$f(x) = -4$	$f(x) < -4$
-8	-28			X
-6	-14			X
-4	-4		X	
-2	2	X		
0	4	X		
2	2	X		
4	-4		X	
6	-14			X
8	-28			X

Figure 1: $y = f(x)$

Plot the points in Table 1 that correspond to solutions to the equation $f(x) = -4$. Where do these points lie relative to the line $y = -4$?

on the line

Plot the points in Table 1 that correspond to solutions to the inequality $f(x) > -4$. Where do these points lie relative to the line $y = -4$?

~~above the line~~

Plot the points in Table 1 that correspond to solutions to the inequality $f(x) < -4$. Where do these points lie relative to the line $y = -4$?

below the line

State the solution set to each of $f(x) = -4$, $f(x) > -4$, and $f(x) < -4$.

The solutions
to $f(x) = -4$
are -4 and 4 .

~~The solution~~ to
 $f(x) > -4$ is
 $(-4, 4)$.

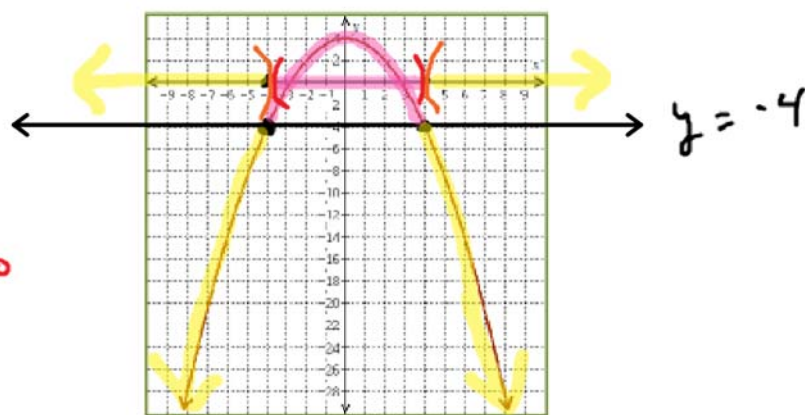


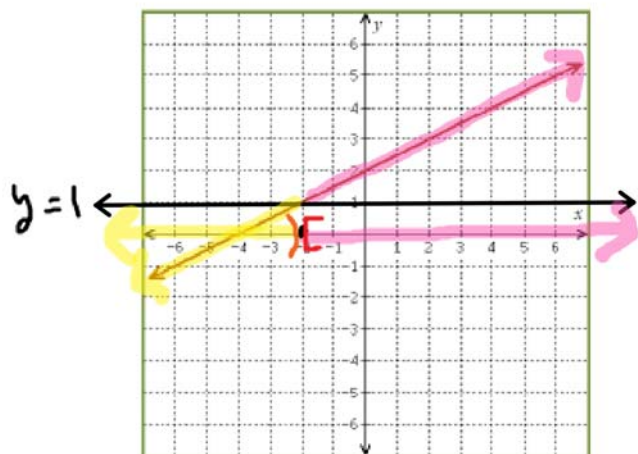
Figure 1: $y = f(x)$

$f(x) = -4$ -4 and 4 $f(x) > -4$ ~~$(-4, 4)$~~

$f(x) < -4$ $(-\infty, -4) \cup (4, \infty)$

Example 2

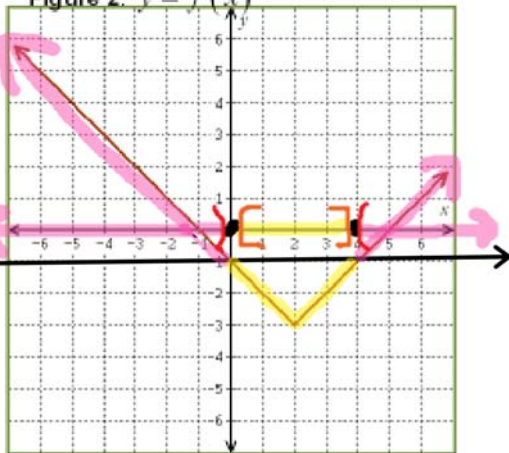
For each graph state the solution sets for the given equation and inequalities.



$f(x) = 1$ $\{-2\}$

$f(x) < 1$ $(-\infty, -2)$

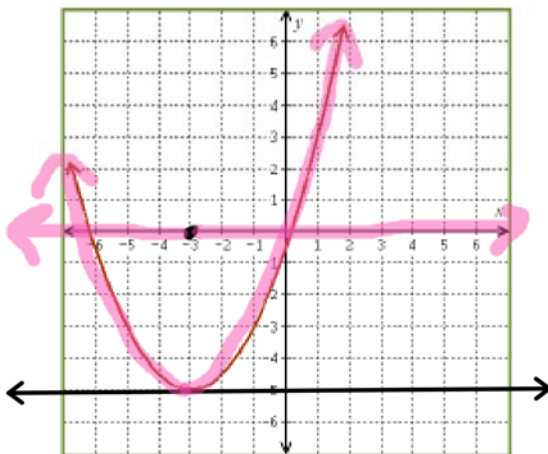
~~$f(x) \geq 1$~~ $[-2, \infty)$

Figure 2: $y = f(x)$ Figure 3: $y = h(x)$ 

$$h(x) = -1 \quad \{0, 4\}$$

$$h(x) \leq -1 \quad [0, 4]$$

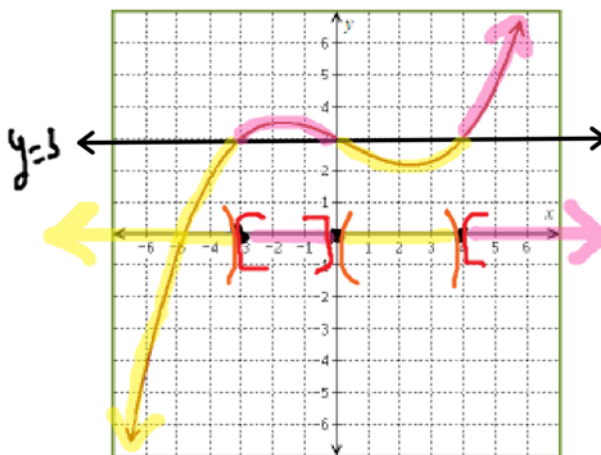
$$h(x) > -1 \quad (-\infty, 0) \cup (4, \infty)$$

Figure 4: $y = k(x)$

$$k(x) = -5 \quad \{-3\}$$

$$k(x) < -5 \quad \{-3\}$$

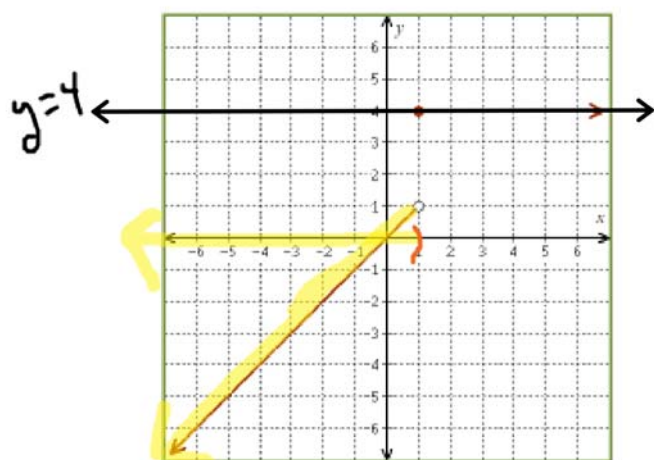
$$k(x) > -5 \quad (-\infty, \infty)$$

Figure 5: $y = z(x)$

$$z(x) = 3 \quad \{-3, 0, 4\}$$

$$z(x) < 3 \quad (-\infty, -3) \cup (0, 4)$$

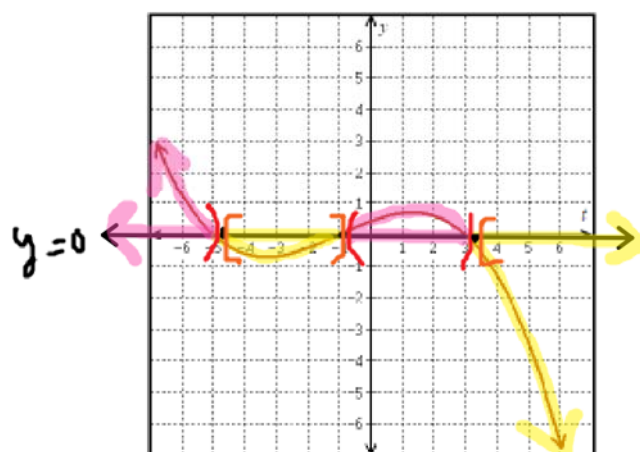
$$z(x) \geq 3 \quad [-3, 0] \cup [4, \infty)$$


Figure 6: $y = g(x)$

$$g(x) = 4 \quad [1, \infty)$$

$$g(x) < 4 \quad (-\infty, 1)$$

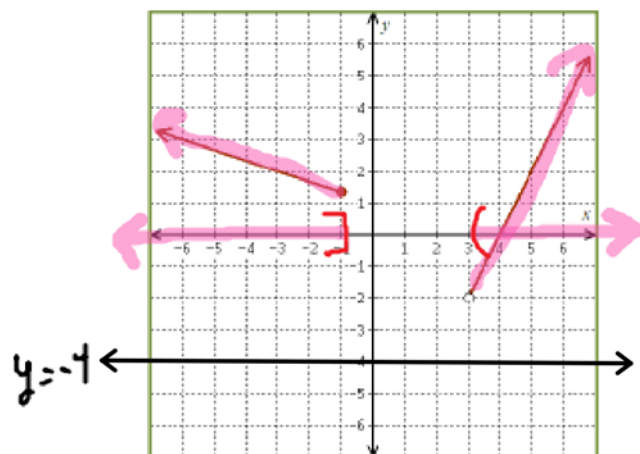
$$g(x) > 4 \quad \emptyset$$


Figure 7: $y = w(t)$

$$w(t) = 0 \quad \{-5, -1, 3\}$$

$$w(t) \leq 0 \quad [-5, -1] \cup [3, \infty)$$

$$w(t) > 0 \quad (-\infty, -5) \cup (-1, 3)$$


Figure 8: $y = T(x)$

$$T(x) = -4 \quad \emptyset$$

$$T(x) < -4 \quad \emptyset$$

$$T(x) \geq -4 \quad (-\infty, -1] \cup (3, \infty)$$