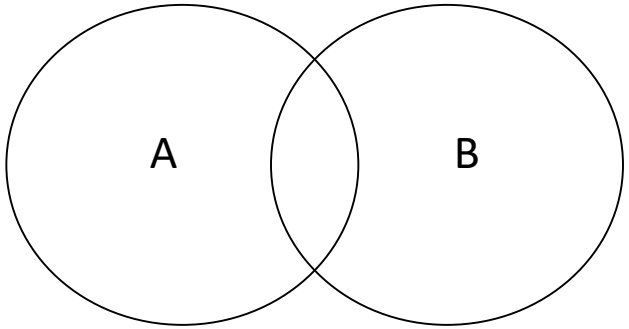
Absolute Value Functions

Compound Inequalities

“or” vs “and”

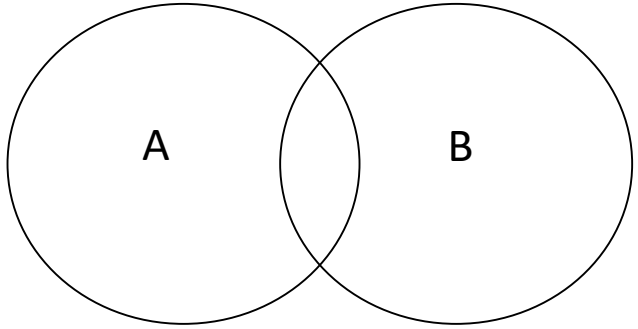
The **union** of two sets A and B is the collection of elements belonging to A **or** B or both. We denote the union of A and B

$A \cup B$



The **intersection** of two sets A and B is the set of all elements that are common to both A **and** B. We denote the intersection of sets A and B as

$A \cap B$



Compound Inequality

A **compound inequality** consists of two inequalities joined by the words *and* or *or*.

Examples: $x+2 > -3$ and $x-3 \leq 2$

$x < 4$ or $x+5 \geq 12$

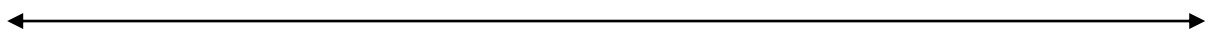
Some compound inequalities involving the word *and* can be written as a **three-part inequality.**

Example: $x > 3$ and $x < 7$ can be written

$3 < x < 7$

Interval Notation

If a and b are real numbers such that $a < b$, we define the **open interval** $\boldsymbol{(a, b)}$ as the set of all numbers x for which $a < x < b$. Thus, $\boldsymbol{(a, b) = \{x \mid a < x < b\}}$

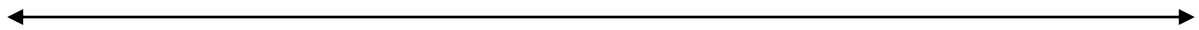


The **closed interval** $\boldsymbol{[a, b]}$ is the set of all numbers x for which $a \leq x \leq b$.

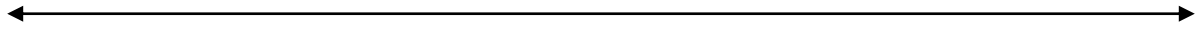
Thus, $\boldsymbol{[a, b] = \{x \mid a \leq x \leq b\}}$

Half-Open Intervals

$$(a, b] = \{x \mid a < x \leq b\}$$

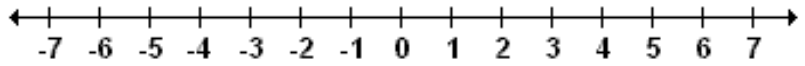


$$[a, b) = \{x \mid a \leq x < b\}$$



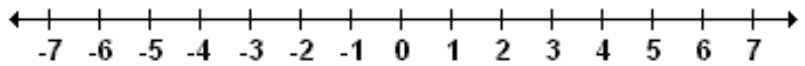
Write each compound inequality in interval notation and graph on a number line.

$-5 \le x < 4$



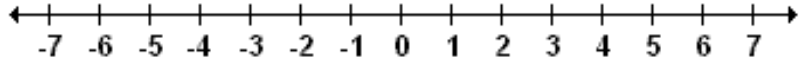
Interval Notation:_____

$-2 \le x \ \ and \ \ x < 3$



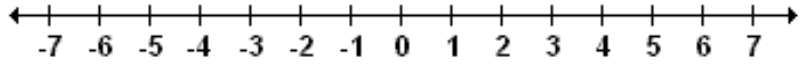
Interval Notation:_____

$x > -1 \ \ and \ \ x \ge 3$



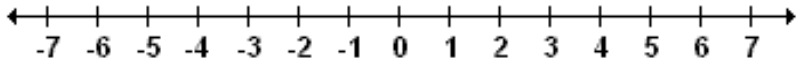
Interval Notation:_____

$x < -4 \ \ or \ \ x \ge 0$



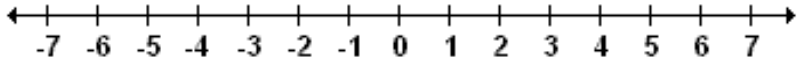
Interval Notation:_____

$x < 5 \ \ or \ \ x \ge 1$



Interval Notation:_____

$-6 > x \ \ or \ \ x < -1$



Interval Notation:_____

Determine whether the given values of *x* are solutions to the compound inequality.

$2x + 1 \geq 4 \; and \; 1 - x \leq 3 \quad x = -2, \qquad x = 3$

Determine whether the given values of *x* are solutions to the compound inequality.

$x + 1 \leq -4 \; or \; x + 1 \geq 4$ $\quad x = -5, \quad x = 2$

Solve the compound inequality. Write your answer in interval notation.

$-7 \le 2x - 3 \ \ and \ \ 3x + 1 < 7$

The solution set is _____

$x + 5 < -3 \ \ or \ \ x + 5 \ge 4$

The solution set is _____

$2x - 6 > -14 \ \ or \ \ 3x + 5 \le 23$

The solution set is _____

$2x - 7 \le 5 \ \ or \ \ 5 - 2x > 3$

The solution set is _____

Solve the three-part inequality. Write your answer in interval notation.

$-3 \leq x + 2 < 5$

The solution set is _____

$\frac{4}{5} \leq \frac{4-2m}{10} \leq 2$

The solution set is _____

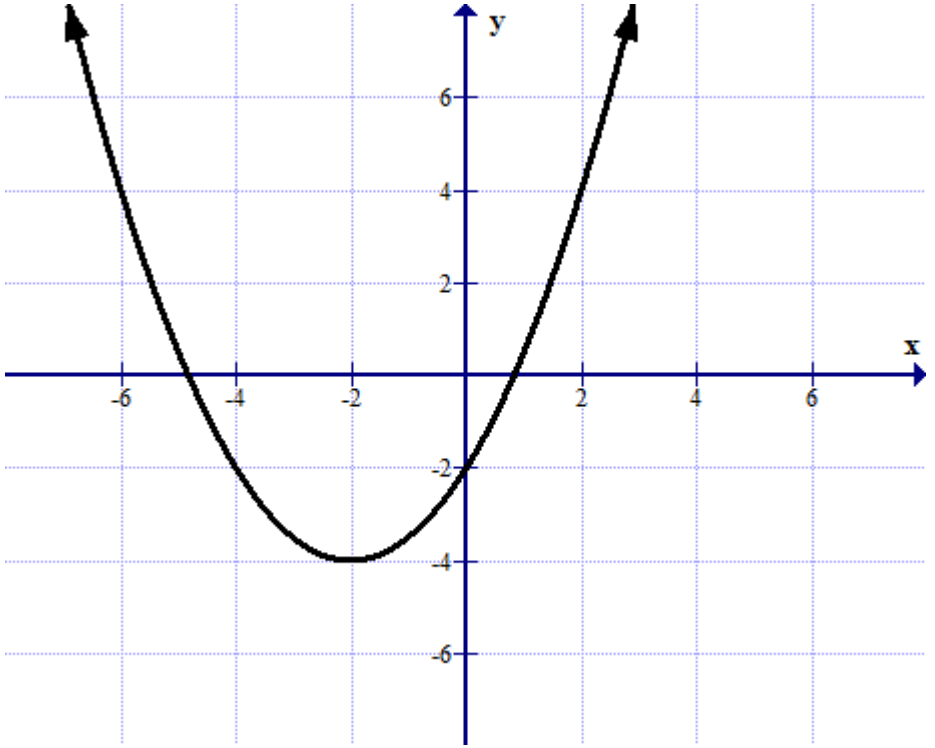
Sarah works part time as a waitress while she is in school and earns $11 per hour plus tips. In a week, assume she averages $150 in tips.

a) Express her average weekly earnings as a linear function, *P*, of the number of hours that she works, *h*.

b) How many hours would she have to work to make between $350 and $400 dollars?

The graph of $y = f(x)$ is given.

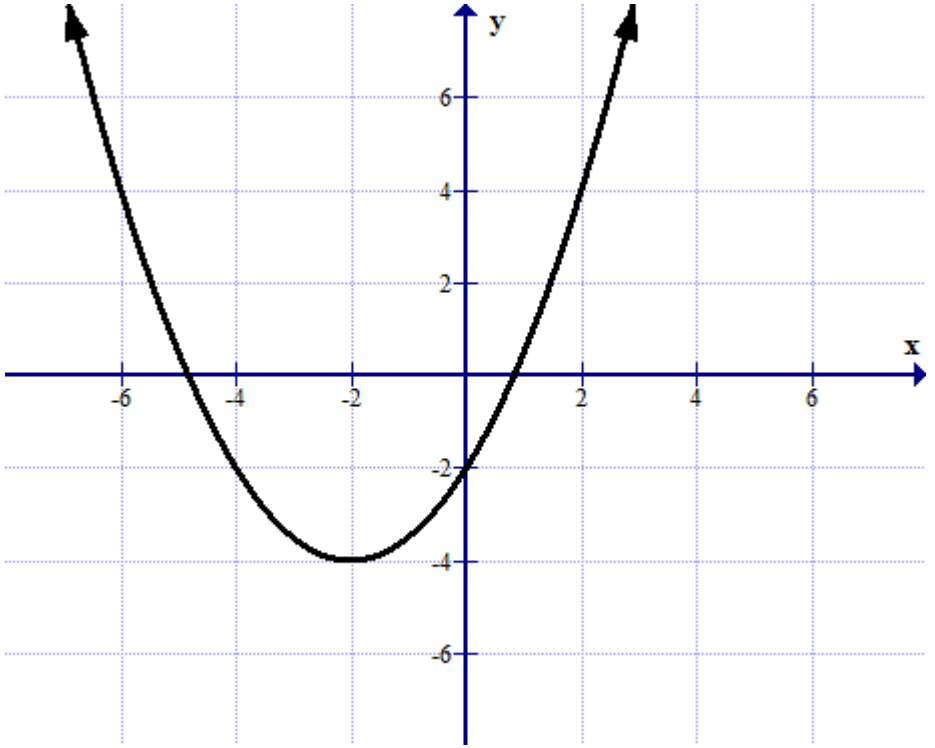
Solve $f(x) < -2$.



The solution set is _____

The graph of $y = f(x)$ is given.

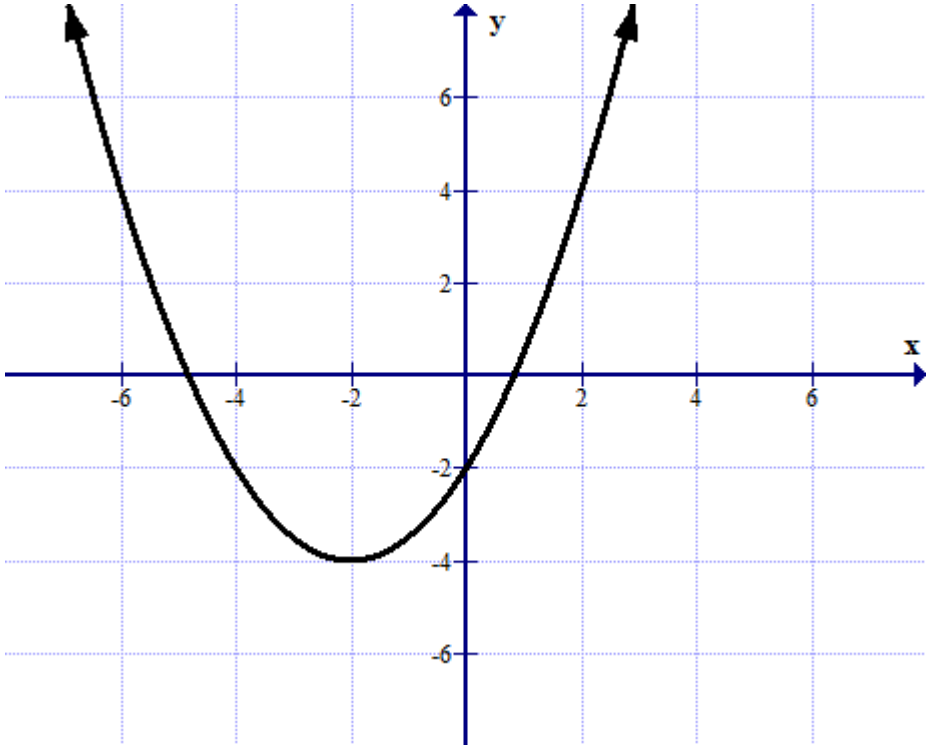
Solve $f(x) \geq 4$.



The solution set is _____

The graph of $y = f(x)$ is given.

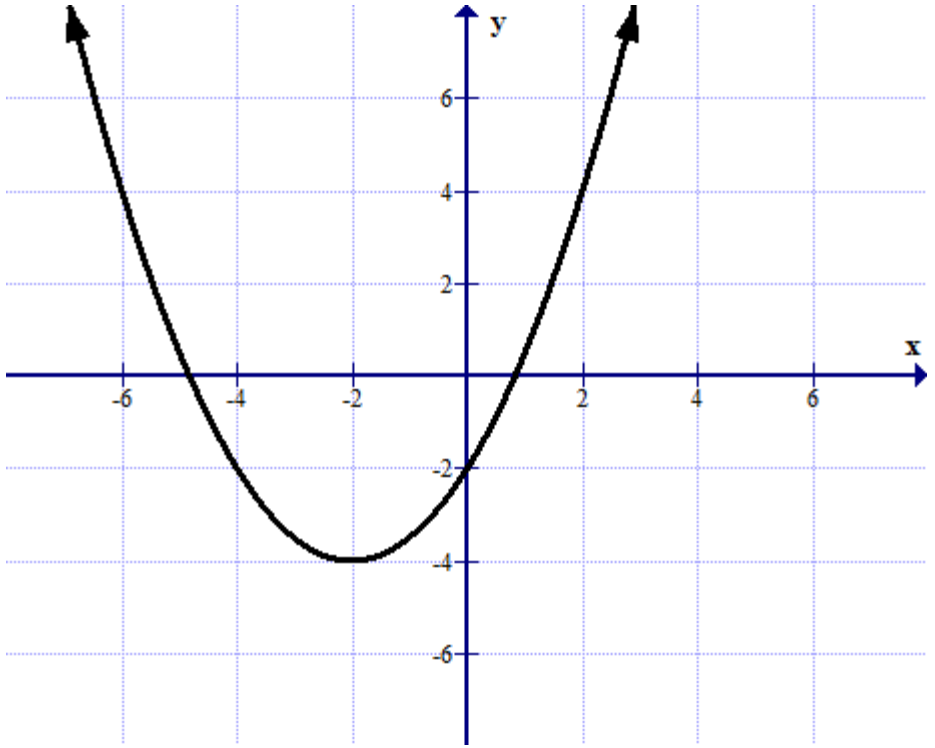
Solve $f(x) = -4$.



The solution set is _____

The graph of $y = f(x)$ is given.

Solve $-2 < f(x) \leq 4$.



The solution set is _____

Find the domain and range of f.