Lesson 22
Inequality Graphs

NAME:

Start by navigating to the Online Lesson for instructions.

Objectives

- Graph inequalities on the coordinate plane (absolute value, radical, linear, quadratic).
- Write an inequality given a graph.
- Determine the solutions for the graph of an inequality.

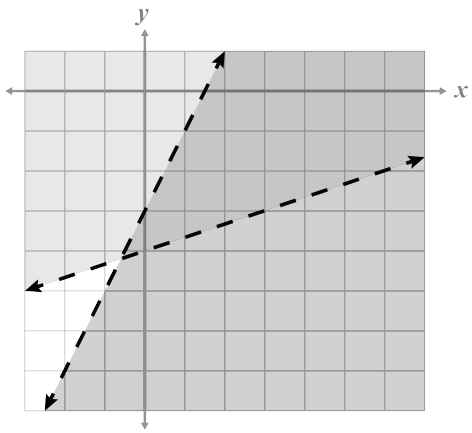
Why?

An inequality graph represents all possible solutions in a given region that is true for the provided inequality or system of inequalities. The same principle applies to graphing inequalities as parent functions and their transformations.

Warm Up

Explain why each ordered pair is or is not a solution to the graph.

1) $(1, -1)$



2) $(0, 0)$

3) $(6, 3.5)$

4) The intersection point of the lines

To continue, return to the Online Lesson.

Explore

Solutions to Inequalities

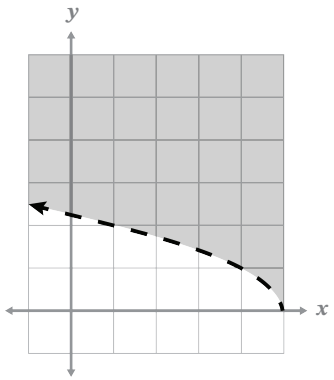
Fill in the notes as you watch the video in the Online Lesson.

- When given an inequality or system of inequalities, use substitution to check _____ if an ordered pair is or is not a solution.
- If you have a graph of an inequality, _____ the location of the ordered pair on the graph.
- Remember, these items are _____ from inequality solutions:
  - dashed curves
  - open points
  - asymptotes
- To write an inequality from a graph consider these items:
  - the _____ to which it belongs (use your formula sheet)
  - how it is _____, or the values a, h, k
  - the inequality _____ (solid or dashed curve and shading)

Example 1

Complete the example as you watch the video in the Online Lesson.

Write the inequality for the given graph.



Plan

Square root
Reflected over the y-axis: $f(-x)$
Translated 5 to the right
Shading above, dashed

Determine if $\{A(-2, -3), B(1, 3), C(5, -1), D(5, 0)\}$ are solutions to the inequality. Explain.

Point A is not a solution because _____.

Point B is a solution because _____.

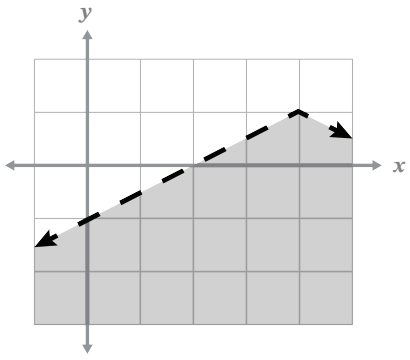
Point C is not a solution because _____.

Point D is not a solution because _____.

Example 2

Complete the example as you watch the video in the Online Lesson.

Write the inequality for the given graph.



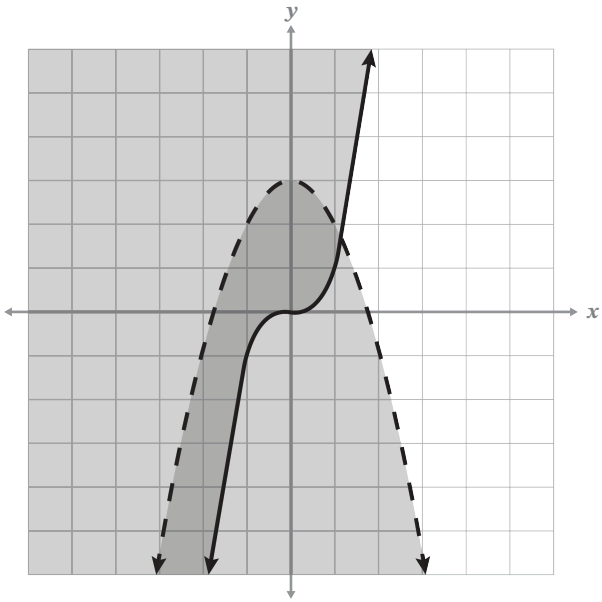
Plan

Absolute value
Reflected over the x-axis
Translated right 4 and up 1
Shading below, dashed

Example 3

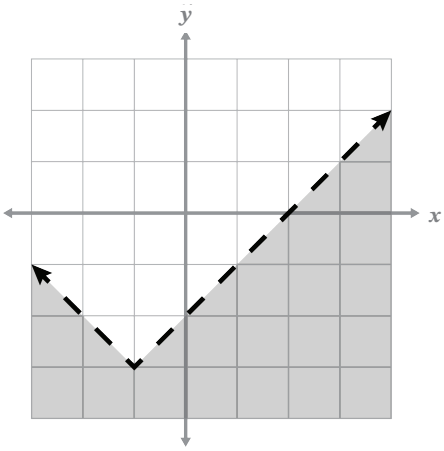
Complete the example as you watch the video in the Online Lesson.

Write the system of inequalities for the given graph.



Checkpoint: Solutions to Inequalities

Write the inequality for the given graph.



To continue, return to the Online Lesson.

Graphing Systems of Non-Linear Inequalities

Fill in the notes as you watch the video in the Online Lesson.

- When given a system of non-linear inequalities remember to determine:
  - the _____ of graph (parent graph)
  - _____ and any other characteristics unique to the graph
  - _____ curves (open/closed points)
  - the _____ region
- The solution is where the shaded regions of all inequalities in the system _____.
- If there is no overlapping region, you must write _____ on or under the graph to note there is no ordered pair that will make all of the inequalities true.

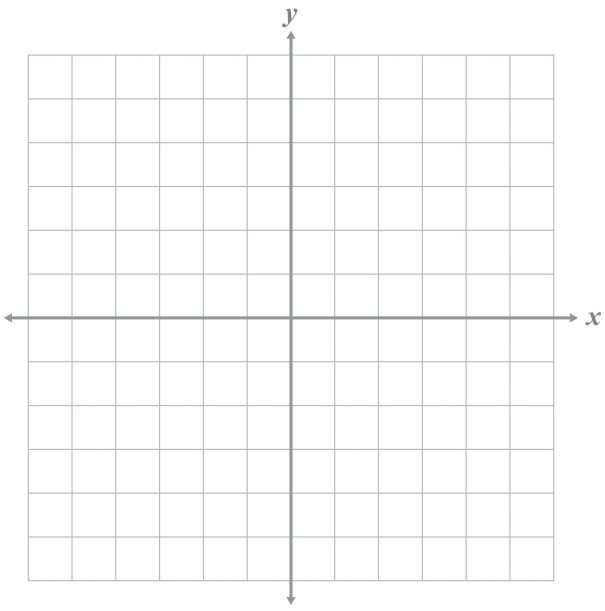
Example 4

Complete the example as you watch the video in the Online Lesson.

Graph the system of inequalities.

$y > |x + 2|$

$y \leq \sqrt{x + 3} - 2$



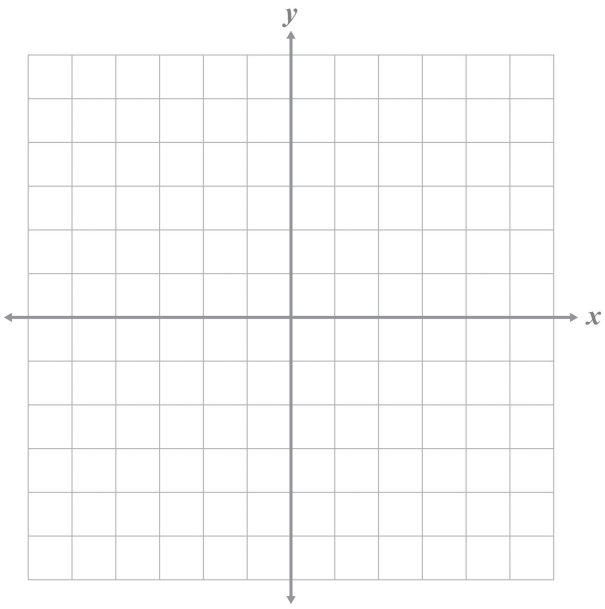
Example 5

Complete the example as you watch the video in the Online Lesson.

Graph the system of inequalities.

$y \geq -|x-3|-1$

$y \leq |x-4|-4$



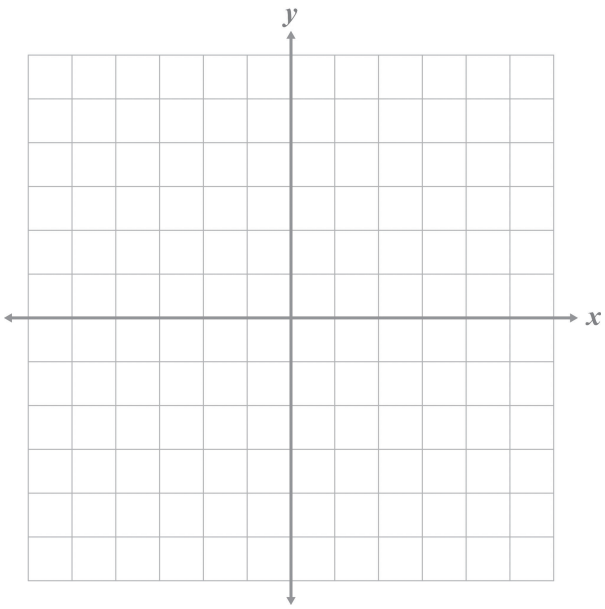
Example 6

Complete the example as you watch the video in the Online Lesson.

Graph the system of inequalities.

$y > \frac{1}{x}$

$y < -\frac{1}{x}$



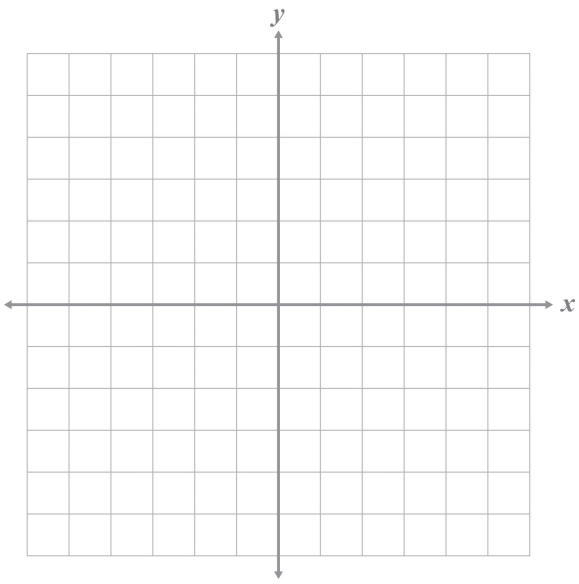
Example 7

Complete the example as you watch the video in the Online Lesson.

Graph the system of inequalities.

$y \geq (x-2)^3 + 1$

$y < \sqrt[3]{x-1} + 2$

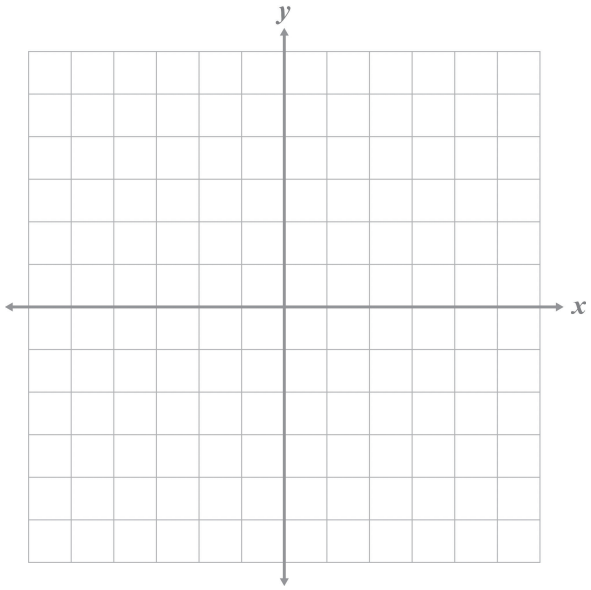


Checkpoint: Graphing Systems of Non-Linear Inequalities

Graph the system of inequalities.

$y \geq x^2$

$y < -|x| + 4$



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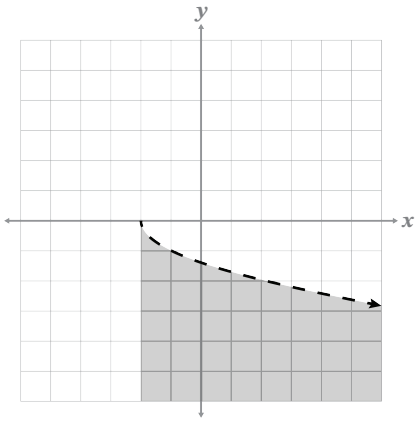
Practice 1

Complete problems on a separate sheet of paper.

1) Write the inequality for the given graph.

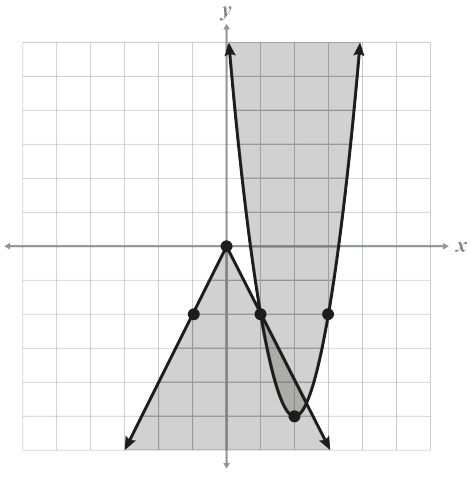


2) Determine if $A\,(0, 0)$, $B\,(2, 0)$, $C\,(0, 2)$, $D\,(5, -5)$ are solutions to the inequality in problem 1.

3) Graph the inequality.

$$y > \frac{1}{2}(x-3)^3 - 1$$

4) Write the system of inequalities for the given graph.



5) How would the solution of the system of inequalities in problem 4 change if the absolute value graph was translated left 4 spaces?

6) Graph the system of inequalities.

$$y > x^3$$

$$y < |x|$$

7) In which quadrant(s) would the solutions occur if the inequality on the absolute value in problem 6 was flipped?

For problems 8–11, use these inequalities:

$y > 2|x + 3|$

$y < 2\sqrt{x} - 3$

8) Graph the inequalities and determine the solutions.

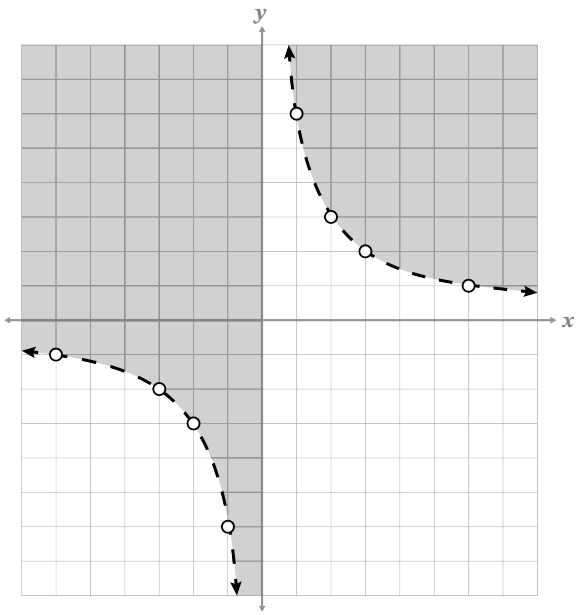
9) Name any asymptotes in the system. Explain why this occurs.

10) Reference problem 8 to write a transformed system of inequalities and graph.

Translate the absolute value inequality right 2 spaces and down 5 spaces from its current location. Reflect the square root inequality across the y-axis.

11) Explain why the point $(0, -3)$ is or is not a solution to the translated graph.

12) Write the inequality for the given graph.



To continue, return to the Online Lesson.

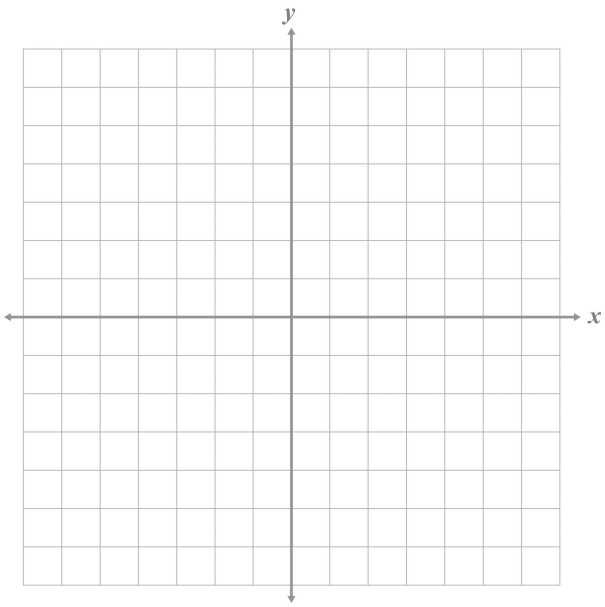
Mastery Check

Show What You Know

A) Graph.

$y < -2(x - 5)^2 - 3$

$y \geq \frac{1}{2}\sqrt{x} - 6$



B) Use the inequalities from part A to write transformed inequalities from the description below.

Transform the quadratic inequality up six spaces and left seven spaces from the given inequality. Transform the radical inequality up two spaces and multiply by a factor of four.

C) Describe the solution to the transformed system of inequalities

Say What You Know

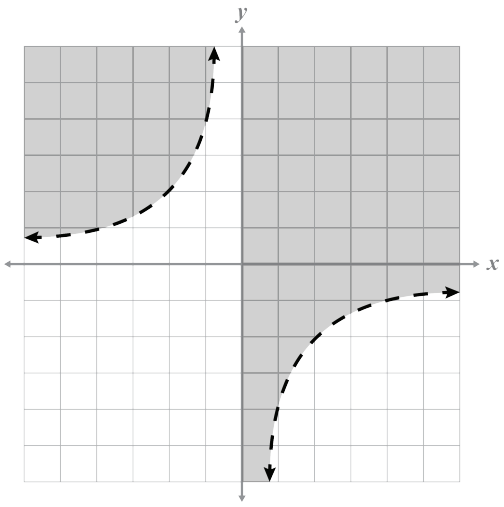
In your own words, talk about what you have learned using the objectives for this part of the lesson and your work on this page.

To continue, return to the Online Lesson.

Practice 2

Complete problems on a separate sheet of paper.

1) Write the inequality for the given graph.



2) Determine if $A\,(2, 2)$, $B\,(-2, 2)$, $C\,(-2,-2)$, $D\,(-5, 5)$ are solutions to the graph in problem 1.

3) Graph.

$y \leq -2(x-3)^2 + 4$

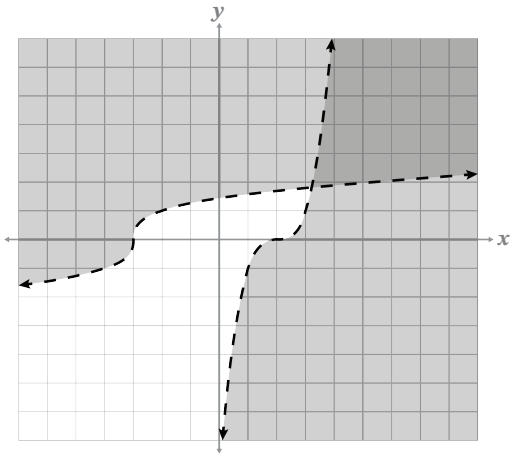
4) Graph the system of inequalities and determine the solutions.

$y > \sqrt{x}$

$y < -x^2$

5) In which quadrant(s) would the solution be located for the quadratic inequality in problem 4 if $a = 1$.

6) Write the system of inequalities from the given graph.



For problems 7–9, use these inequalities:

$$y \leq \frac{2}{5}|x-4|+3$$

$$y \geq \frac{1}{3}(x-2)^2$$

7) Graph the system of inequalities.

8) Explain how the graph of the system would change when the absolute value inequality is $a = -\frac{2}{5}$.

9) Transform the system of inequalities in problem 7.

Translate the absolute value inequality 5 spaces to the left and down 2 spaces.
Reflect the quadratic inequality across the x-axis and translate it up 3 spaces.

10) Graph the system of inequalities from problem 9.

11) Graph the system of inequalities.

$$y \leq \sqrt{-x}+2$$

$$y \geq 3x^2$$

12) Describe the solution if the parabola in problem 11 was translated 2 spaces to the right.

To continue, return to the Online Lesson.