Quadratic Inequalities

Graph the solution to the inequality: $4 > x^2 - 3x - 1$

$x^2 - 3x - 1 = 4$

Write the inequality as an equation.

$x^2 - 3x - 5 = 0$

Get equation set equal to zero.

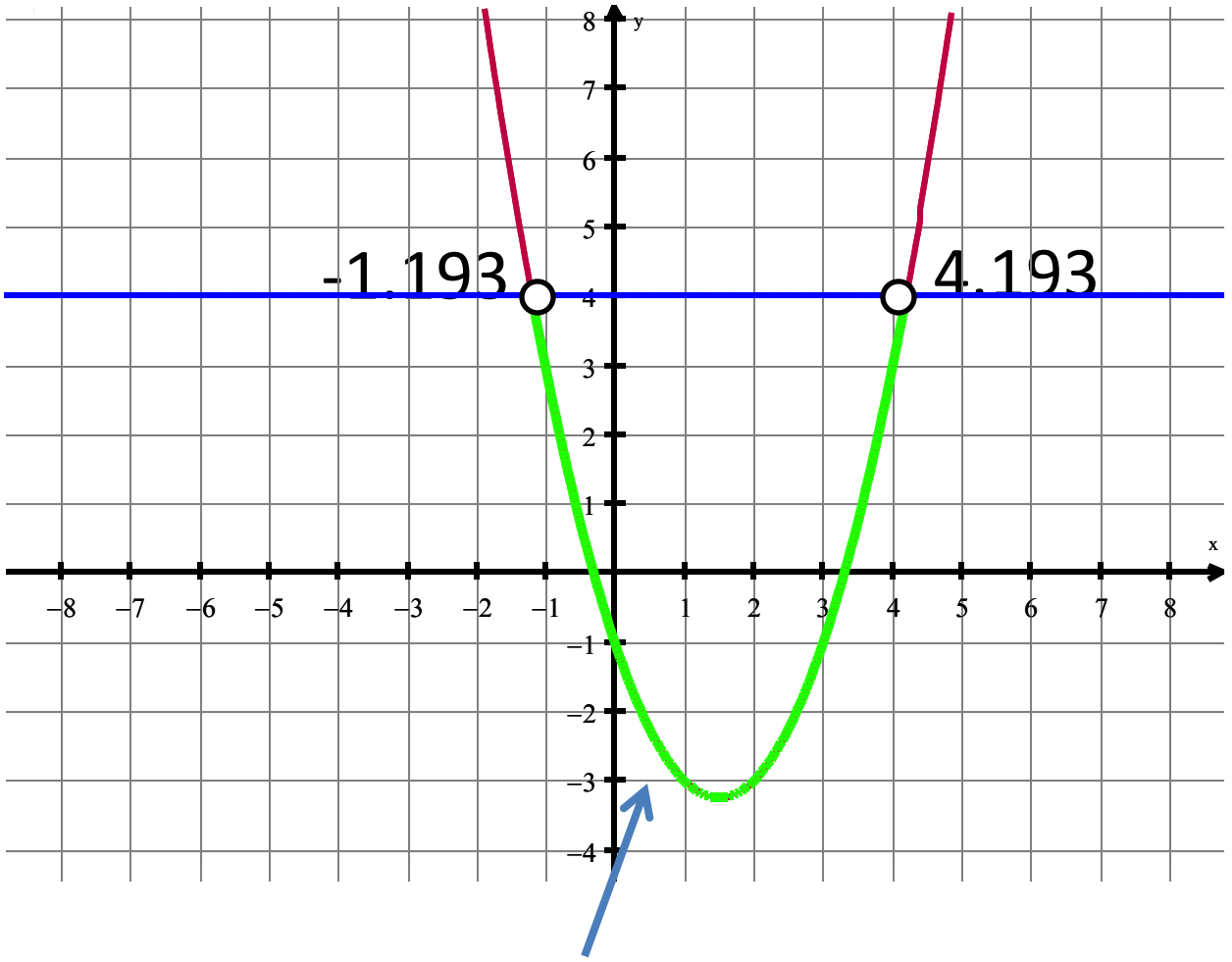
$x = \frac{3 \pm \sqrt{29}}{2}$

Solve the quadratic: use quadratic formula because the equation does not factor.

$x = \frac{3+\sqrt{29}}{2}$ and $x = \frac{3-\sqrt{29}}{2}$

$x = 4.193$ and $x = -1.193$

Graph the two lines and shade the part of the quadratic that is less than the line y = 4.



Solution region: (-1.193, 4.193)

Ex) Solve $2x^2 - 6x - 32 > -12$

$2x^2 - 6x - 32 = -12$ Write the inequality as an equation.

$2x^2 - 6x - 20 = 0$ Get equation set equal to zero.

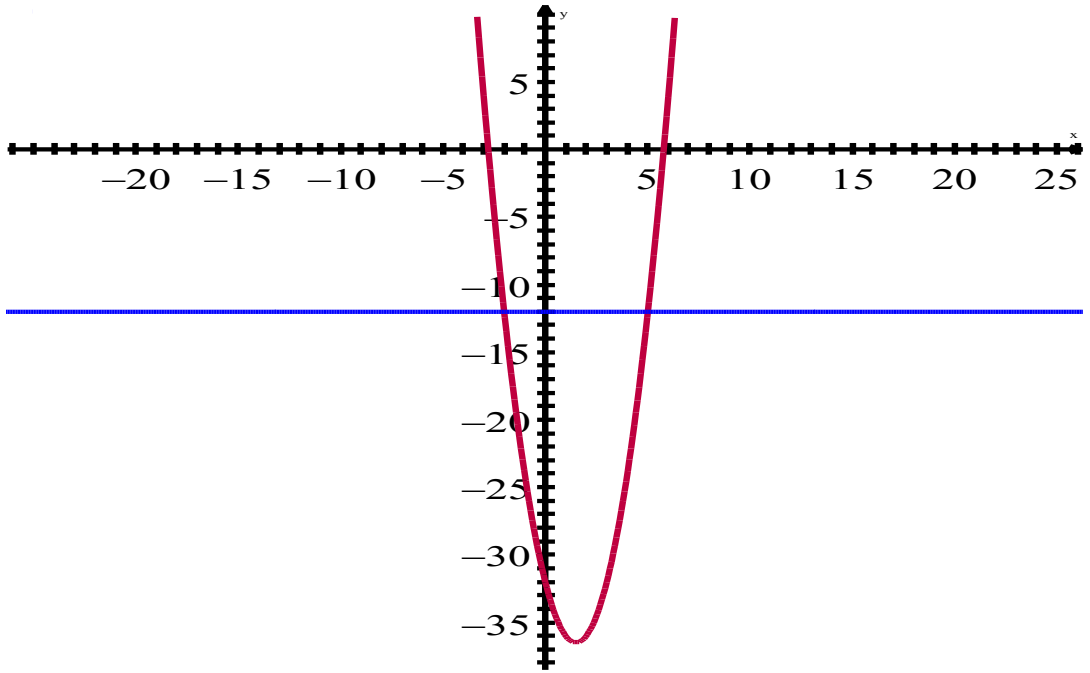
$2(x^2 - 3x - 10) = 0$ Solve the quadratic: This quadratic can be factored. Start with GCF.

$2(x - 5)(x + 2) = 0$

$x - 5 = 0$ and $x + 2 = 0$

$x = 5$ and $x = -2$

Think about the shape of the graph to determine the solution set. The parabola is upward facing because a = 2. An upward facing parabola will be above y = -12 outside of the points of intersection.



You can substitute a value from the solution set into the original inequality to see if it holds true.

$2(6)^2 - 6(6) - 32 > -12$

$4 > -12$ ✓

The solution set is $(-\infty, -2) \cup (5, \infty)$

Ex) A volleyball player serves a ball that follows the path given by the equation $y = -0.025x^2 + 0.6x + 6$ with the origin directly below where the player hits the ball. The ball can be hit or blocked when it is 9 feet or lower. What distances from the player can the ball be hit or blocked?

$-0.025x^2 + 0.6x + 6 \leq 9$ Write an inequality for the problem.

$-0.025x^2 + 0.6x + 6 = 9$ Write the inequality as an equation.

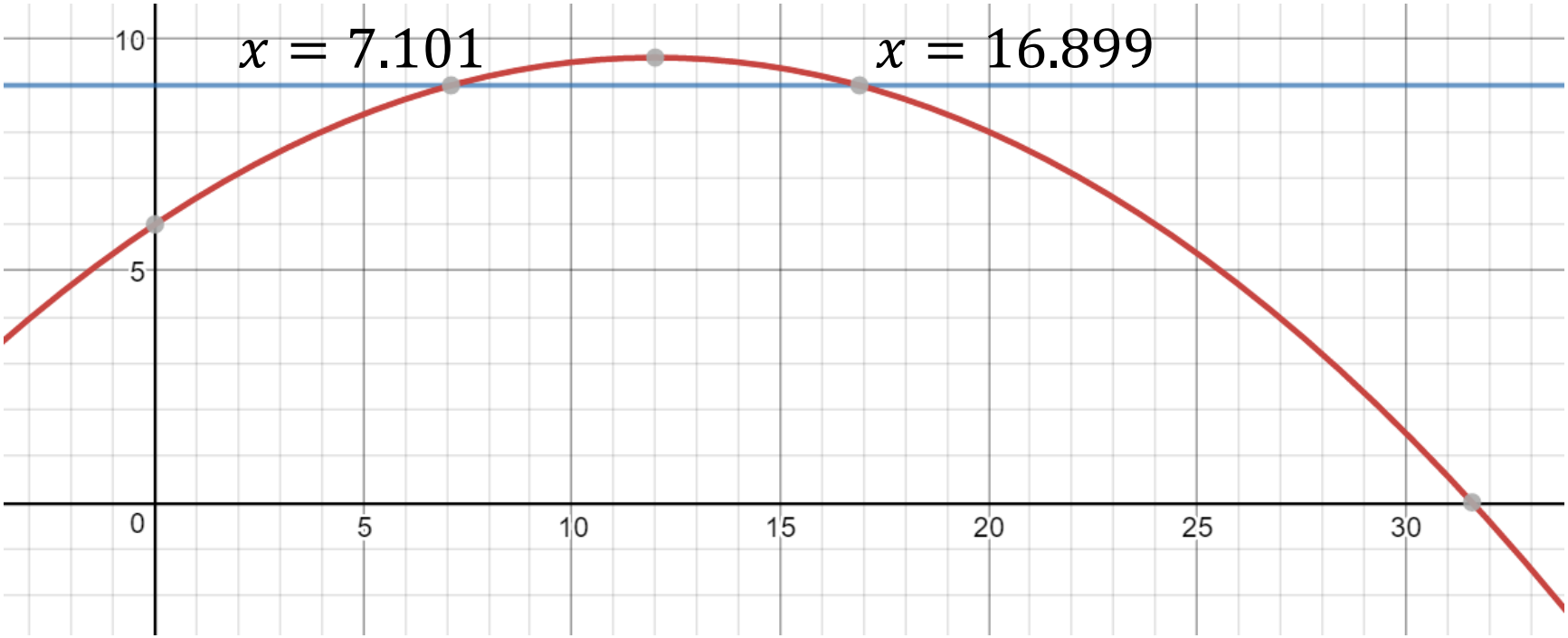
$-0.025x^2 + 0.6x - 3 = 0$ Get equation set equal to zero.

$x = \frac{-.6 \pm \sqrt{.06}}{-.05}$ Solve the quadratic: use quadratic formula because the equation does not factor.

$x = \frac{-.6+\sqrt{.06}}{-.05}$ and $x = \frac{-.6-\sqrt{.06}}{-.05}$

$x = 16.899$ and $x = 7.101$

Here is the graph of the problem. The ball can be hit below the blue line y = 9. We also need to find the x-value when the ball hits the ground.



$-0.025x^2 + 0.6x + 6 = 0$

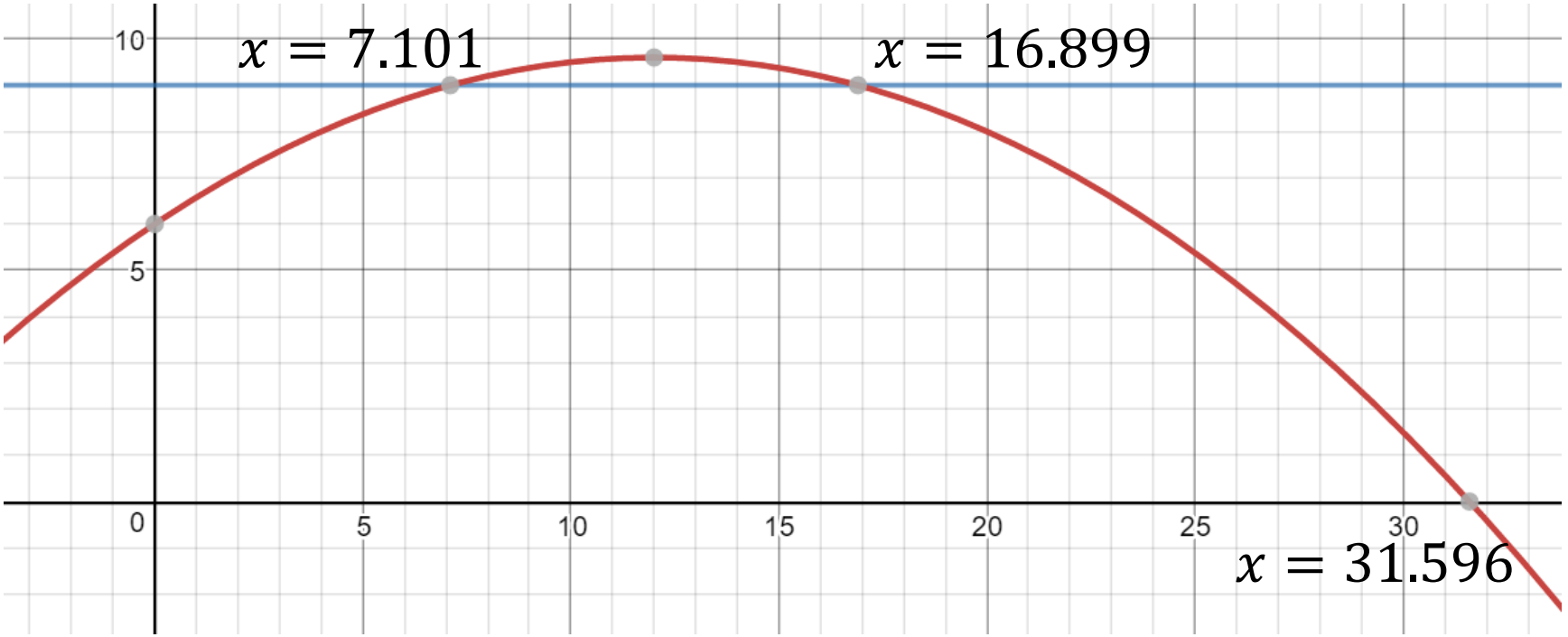
Set equation equal to zero to find when the ball is on the ground.

Solve the quadratic: use quadratic formula because the equation does not factor.

$$x = \frac{-.6 \pm \sqrt{.96}}{-.05}$$

$$x = \frac{-.6 + \sqrt{.96}}{-.05} \text{ and } x = \frac{-.6 - \sqrt{.96}}{-.05}$$

$$x = -7.596 \text{ and } x = 31.596$$



The solution set is [0, 7.101] U [16.899, 31.596]