GCE A Level 9709

SMIYL

March 2023

1.1 Quadratics

In this topic we will learn how to:

- solve quadratic inequalities in one unknown

Quadratic Inequalities

To be able to solve a quadratic inequality, you should be able to solve a quadratic equation. The first step in solving a quadratic inequality is finding the roots of the quadratic, by solving it. Once you have the roots of the quadratic, you can then solve the inequality. There are four possible quadratic inequalities:

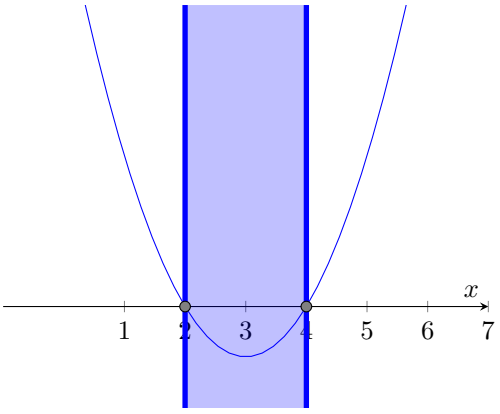
1. When the coefficient of x^2 is positive and we are looking for the less than region.

$$ax^2 + bx + c < 0$$

$$x^2 - 6x + 8 < 0$$

$$(x-2)(x-4) = 0$$

$$x = 2, x = 4$$



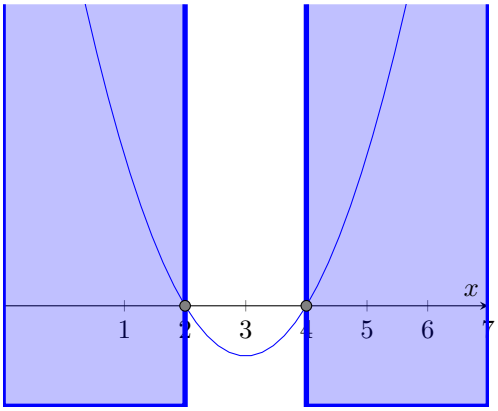
From 2 to 4, the curve is below the x-axis, therefore, our solution is the shaded region, since we want the LESS than region.

Therefore, the solution is,

$$2 < x < 4$$

2. When the coefficient of x^2 is positive and we are looking for the greater than region.

$$ax^2 + bx + c > 0$$
$$x^2 - 6x + 8 > 0$$
$$(x-2)(x-4) = 0$$
$$x = 2, x = 4$$



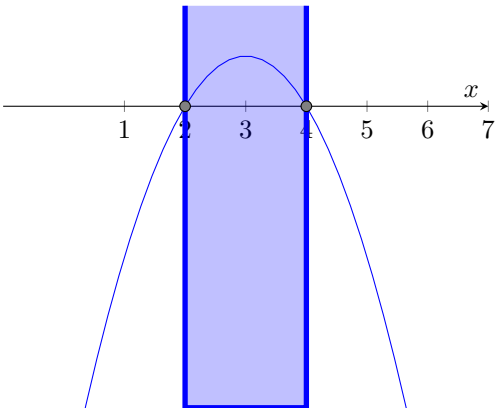
In the regions $x < 2$ to $x > 4$, the curve is above the x-axis, therefore, our solution is the shaded region, since we want the GREATER than region.

Therefore, the solution is,

$$x < 2, x > 4$$

3. When the coefficient of x^2 is negative and we are looking for the greater than region.

$$-ax^2 + bx + c > 0$$
$$-x^2 + 6x - 8 > 0$$
$$(x-2)(4-x) = 0$$
$$x = 2, x = 4$$



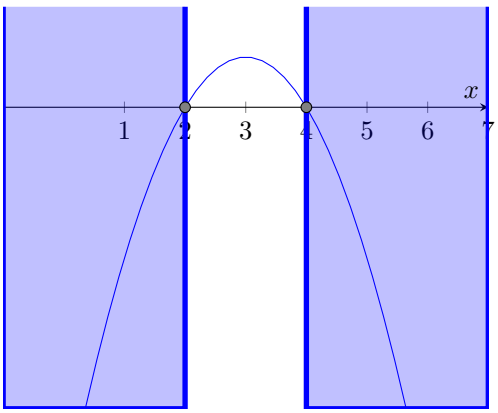
From 2 to 4, the curve is above the x-axis, therefore, our solution is the shaded region, since we want the GREATER than region.

Therefore, the solution is,

$$2 < x < 4$$

4. When the coefficient of x^2 is negative and we are looking for the less than region.

$$-ax^2 + bx + c < 0$$
$$-x^2 + 6x - 8 < 0$$
$$(x-2)(4-x) = 0$$
$$x = 2, x = 4$$



In the regions $x < 2$ to $x > 4$, the curve is below the x-axis, therefore, our solution is the shaded region, since we want the LESS than region.

Therefore, the solution is,

$$x < 2, x > 4$$

Note: The third and fourth cases can be converted into the first and second cases respectively, by multiplying the whole quadratic inequality by -1. So in reality, there are only two scenarios at play.