

# Solving Quadratic Inequalities (A) - without sketching

ANSWERS



## Section A

The solutions to  $x^2 - 9x + 18 = 0$ , are  $x = 6$  and  $x = 3$ .

- 1) Use substitution to determine if  $x < 3$  whether  $x^2 - 9x + 18 < 0$ .

*Hint: Use  $x = 2$*

$$(2)^2 - 9(2) + 18 = 4, x^2 - 9x + 18 < 0$$

- 2) Use substitution to determine if  $3 < x < 6$  whether  $x^2 - 9x + 18 < 0$ .

*For example, if  $x = 4$*

$$x^2 - 9x + 18 = (4)^2 - 9(4) + 18 = -2, \text{ so } x^2 - 9x + 18 < 0$$

- 3) Use substitution to determine if  $x > 6$  whether  $x^2 - 9x + 18 < 0$ .

*For example, if  $x = 7$*

$$x^2 - 9x + 18 = (7)^2 - 9(7) + 18 = 4, \text{ so } x^2 - 9x + 18 < 0.$$

- 4) Use your answers to questions 1 - 3 to find the solutions to  $x^2 - 9x + 18 < 0$ .

$$3 < x < 6$$

- 5) Use your answers to find the solutions to the following inequalities:

a.  $x^2 - 9x + 18 > 0$

$$x < 3 \quad x > 6$$

b.  $x^2 - 9x + 18 \geq 0$

$$x \leq 3 \quad x \geq 6$$

c.  $x^2 + 18 \leq 9x$

$$3 \leq x \leq 6$$

d.  $x^2 < 9x - 18$

$$3 < x < 6$$

## Section B

Follow the steps to solve the quadratic inequalities.

- 1)  $x^2 + 9x + 8 > 0$

- a. Solve  $x^2 + 9x + 8 = 0$

$$x = -8 \quad x = -1$$

- b. When  $x < -8$ , is  $x^2 + 9x + 8 > 0$ ?

$$x = -10$$

$$(-10)^2 + 9(-10) + 8 = 18$$

$$x^2 + 9x + 8 > 0$$

- c. When  $-8 < x < -1$ , is  $x^2 + 9x + 8 > 0$ ?

$$x = -5$$

$$(-5)^2 + 9(-5) + 8 = -12$$

$$x^2 + 9x + 8 > 0$$

- d. When  $x > -1$ , is  $x^2 + 9x + 8 > 0$ ?

$$x = 0$$

$$(0)^2 + 9(0) + 8 = 8$$

$$x^2 + 9x + 8 > 0$$

- e. State the final solution, using inequalities.

$$x < -8 \quad x > -1$$

- 2)  $x^2 + 16x + 63 \geq 0$

- a. Solve  $x^2 + 16x + 63 = 0$

$$x = -9 \quad x = -7$$

- b. When  $x < -9$ , is  $x^2 + 16x + 63 \geq 0$ ?

$$x = -10$$

$$(-10)^2 + 16(-10) + 63 = 3$$

$$x^2 + 16x + 63 \geq 0$$

- c. When  $-9 < x < -7$ , is  $x^2 + 16x + 63 \geq 0$ ?

$$x = -8$$

$$(-8)^2 + 16(-8) + 63 = -1$$

$$x^2 + 16x + 63 \geq 0$$

- d. When  $x > -7$ , is  $x^2 + 16x + 63 \geq 0$ ?

$$x = 0$$

$$(-0)^2 + 16(0) + 63 = 63$$

$$x^2 + 16x + 63 \geq 0$$

- e. State the final solution, using inequalities.

$$x \leq -9 \quad x \geq -7$$

## Solving Quadratic Inequalities (A) - without sketching

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3)  $x^2 - 8x + 12 < 0$

a. Solve  $x^2 - 8x + 12 = 0$

$x = 2 \quad x = 6$

b. When  $x < 2$ , is  $x^2 - 8x + 12 < 0$ ?

$x = 0$

$x^2 - 8x + 12 = 12$

$x^2 - 8x + 12 < 0$

c. When  $2 < x < 6$ , is  $x^2 - 8x + 12 < 0$ ?

$x = 4$

$x^2 - 8x + 12 = -4$

$x^2 - 8x + 12 < 0$

d. When  $x > 6$ , is  $x^2 - 8x + 12 < 0$ ?

$x = 7$

$x^2 - 8x + 12 = 5$

$x^2 - 8x + 12 < 0$

e. State the final solution, using inequalities.

$2 < x < 6$

4)  $-x^2 - 3x + 10 \leq 0$

a. Solve  $-x^2 - 3x + 10 = 0$

$x = -5 \quad x = 2$

b. When  $x < -5$ , is  $-x^2 - 3x + 10 \leq 0$ ?

$x = -6$

$-x^2 - 3x + 10 = -8$

$-x^2 - 3x + 10 \leq 0$

c. When  $-5 < x < 2$ , is  $-x^2 - 3x + 10 \leq 0$ ?

$x = 0$

$-x^2 - 3x + 10 = 10$

$-x^2 - 3x + 10 < 0$

d. When  $x > 2$ , is  $-x^2 - 3x + 10 \leq 0$ ?

$x = 6$

$-x^2 - 3x + 10 = -44$

$-x^2 - 3x + 10 \leq 0$

e. State the final solution, using inequalities.

$x \leq -5 \quad x \geq 2$

### Section C

Solve the quadratic inequalities.

1)  $x^2 - 4x - 21 \geq 0$

$x \leq -3 \quad x \geq 7$

2)  $x^2 + 2x - 15 < 0$

$-5 < x < 3$

3)  $x^2 - 14x + 45 \leq 0$

$5 \leq x \leq 9$

4)  $x^2 + 3x - 54 > 0$

$x < -9 \quad x > 6$

5)  $x^2 + 5x + 4 \leq 0$

$-4 \leq x \leq -1$

6)  $-x^2 + 5x - 4 \leq 0$

$x \leq 1 \quad x \geq 4$

7)  $2x^2 - 5x - 3 \geq 0$

$x \leq -\frac{1}{2} \quad x \geq 3$

8)  $3x^2 < 22x + 16$

$-\frac{2}{3} < x < 8$