

# Quadratic inequalities\_1

Monday, October 27, 2025 5:00 PM

1 Solve the inequality  $(+x^2) - 5x - 6 > 0$   $\rightarrow$   $(+)$

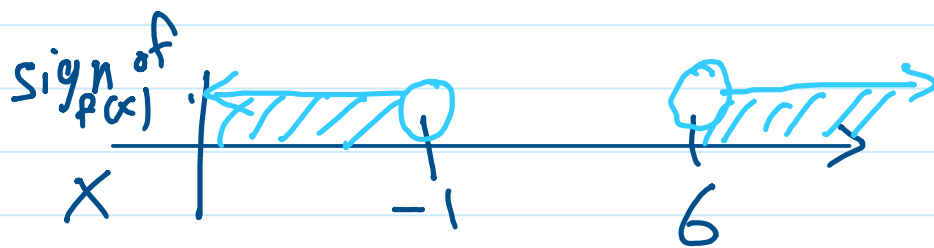
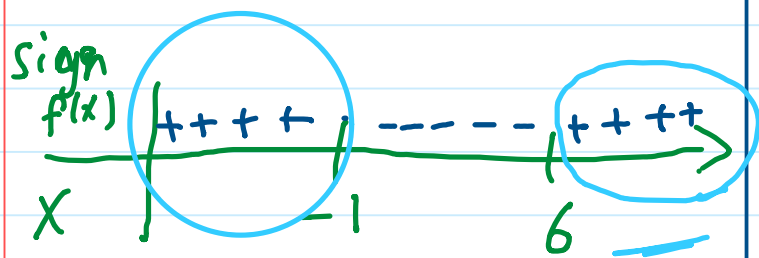
(1.5)

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$$x^2 - 5x - 6 = 0 \quad \rightarrow \quad x^2 - 5x - 6 = 0$$

$$(x - 6)(x + 1) = 0 \quad \rightarrow \quad (x - 6)(x + 1) = 0$$

$$x = 6 \quad x = -1 \quad \rightarrow \quad x = 6 \quad x = -1$$



# Quadratic inequalities\_2

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Find in  $\mathbb{R}$  the solution set of each of the following inequalities :

1  $x^2 - 3x + 5 < 0$

2  $x^2 + 2x + 4 > 0$

3  $4x - x^2 - 4 < 0$

4  $x^2 - 6x + 9 \leq 0$

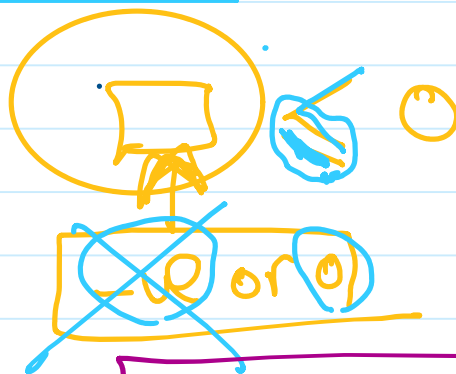
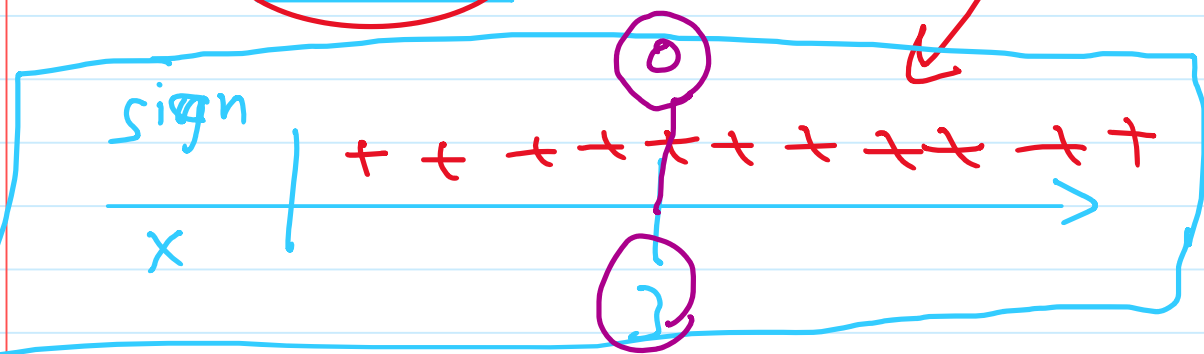
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quad-

$$x^2 - 6x + 9 = 0$$

$$(x - 3)(x - 3) = 0$$

$$x = 3$$



$$S.S = \{3\}$$

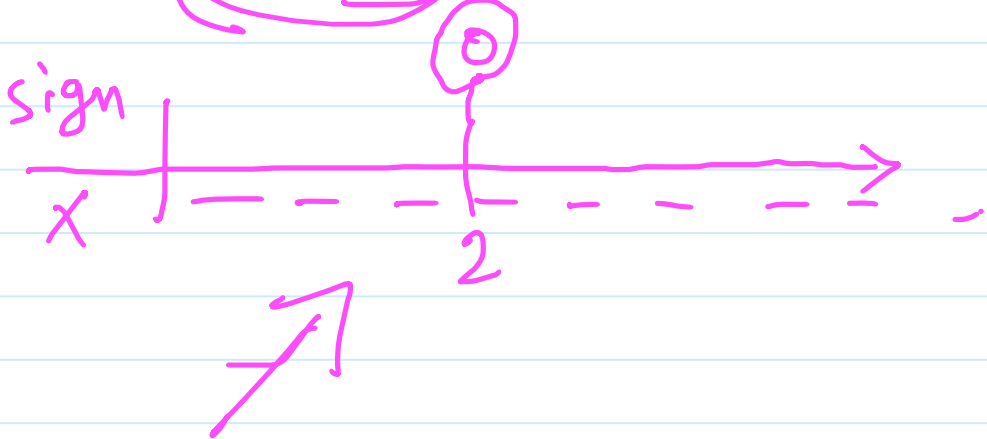
$$4x - x^2 - 4 < 0$$

$$S.S = \mathbb{R} - \{2\}$$

$$x^2 - 4x + 4 = 0$$

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

$$x = 2$$



$$4x - x^2 - 4 = 0$$

$$-x^2 + 4x - 4 = 0 \quad (*-1)$$

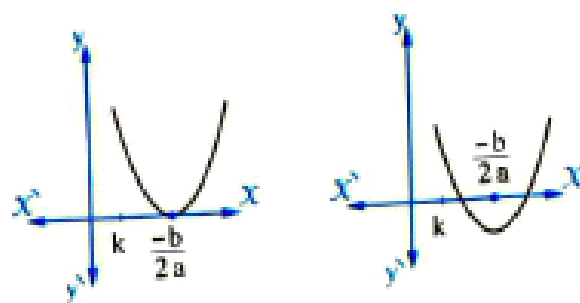
$$x^2 - 4x + 4 = 0$$

## Remarks

If the quadratic equation  $aX^2 + bX + c = 0$  where  $f$  is the related function with it, then:

1) Conditions that each of the two roots of the equation is greater than a real number  $k$  are:

- $b^2 - 4ac \geq 0$
- $a f(k) > 0$
- $-\frac{b}{2a} > k$

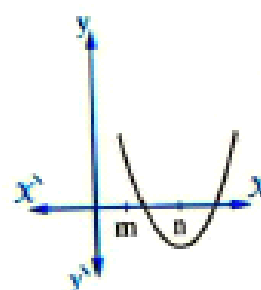


For example:

If each of the two roots of the equation  $X^2 - 5X + m = 0$  is greater than 2, then:

- $25 - 4m \geq 0 \quad \therefore m \leq 6 \frac{1}{4}$
  - $4 - 5(2) + m > 0 \quad \therefore m > 6$
  - $\frac{5}{2} > 2$  "satisfied for all values of  $m$ "
- then to satisfy the 3 conditions:  $6 < m \leq 6 \frac{1}{4}$

2) Conditions that only one of the two roots of the equation lies between the two real numbers  $m, n$  is:  $f(m) \times f(n) < 0$



For example:

If only one root of the equation  $X^2 - bX + 12 = 0$  is belong to the interval  $]1, 4[$

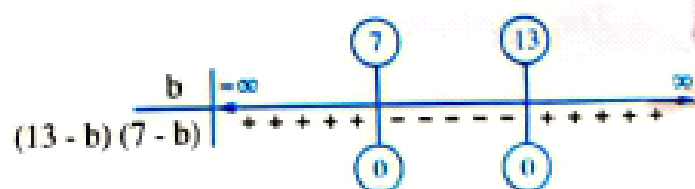
then  $f(1) \times f(4) < 0$

$$\therefore (1 - b + 12)(16 - 4b + 12) < 0$$

$$\therefore (13 - b)(28 - 4b) < 0$$

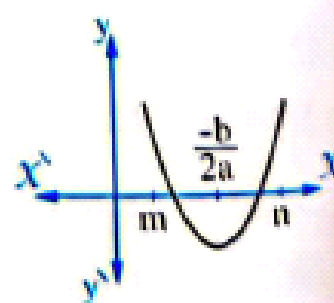
$$\therefore (13 - b)(7 - b) < 0$$

$$\therefore b \in ]7, 13[$$



3) Conditions that the two roots of the equation are lying between the two real numbers  $m, n$  where  $m < n$  are:

- $b^2 - 4ac \geq 0$
- $a f(m) > 0$
- $a f(n) > 0$
- $m < -\frac{b}{2a} < n$



$$\text{Vertex} = \frac{-b}{2a}$$

$$x^2 - 4x + 4 = f(x)$$

$$a=1 \quad b=-4 \quad c=4$$

$$\text{Vertex} = \frac{-b}{2a} = \frac{4}{2} = 2$$

$$(x, y) = (2, y)$$

$$2^2 - 4 \times 2 + 4 = f(x)$$

$$4 - 8 + 4 = y$$

$$y = 0$$

$$(2, 0)$$