[06-09-11-T11]

Quadratic Inequalities

■ **For all questions on this problem set, answer using *both* interval notation and statements such as $-5 \le x < 5$ or $x < -8 \vee x > 2$.**

■ **A. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x^2 - x - 12 \le 0$

[2] $x^2 - x - 12 > 0$

[3] $x^2 + 2x - 15 \ge 0$

[4] $x^2 + 2x - 15 < 0$

[5] $x^2 - 11x + 28 \le 0$

[6] $x^2 - 11x + 28 \ge 0$

■ **B. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x^2 - 5 > 0$

[2] $x^2 - 5 < 0$

[3] $x^2 - 49 \le 0$

[4] $x^2 - 49 \ge 0$

[5] $x^2 < 9$

[6] $-x^2 + 9 < 0$

■ **C. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x^2 + 14x + 49 < 0$

[2] $x^2 + 14x + 49 > 0$

[3] $x^2 > 8x - 15$

[4] $x^2 - 8x > -15$

[5] $2x^2 - 22x + 60 > 0$

[6] $2(x - 5)(x - 6) < 0$

■ **D. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x^2 - 4x + 3 > 0$

[2] $x^2 - 4x + 3 < 0$

[3] $x^2 - 22x + 121 \geq 0$

[4] $x^2 - 22x + 121 \leq 0$

[5] $x^2 + 2\sqrt{2}\,x + 2 < 0$

[6] $x^2 + 2\sqrt{2}\,x + 2 > 0$

■ **E. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x^2 + 1 < 0$

[2] $x^2 + 1 \leq 0$, careful. The instructions at the top ask for all $x \in \mathbb{R}$.

[3] $x^2 + x - 5 \geq 0$

[4] $x^2 + x - 5 < 0$

[5] $2x^2 + x - 2 < 0$

[6] $2x^2 + x - 2 \geq 0$

■ **F. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x^2 + x + 3 \geq 0$

[2] $4x^2 \geq -x - 2$

[3] $x^2 - 4x + 3 \geq 0$

[4] $x^2 - 4x + 4 < 0$

[5] $x^2 - 4x + 5 < 0$

[6] $x^2 - 3x + 5 \geq -x^2 + 2x$

■ **G. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x^2 + x + 3 \geq 0$

[2] $0 \geq x^2$

[3] $\begin{cases} x^2 - 9x + 20 > 0 \\ x^2 - 6x + 9 < 0 \end{cases}$

[4] $\begin{cases} x^2 < 5 \\ x^2 > 0 \end{cases}$

[5] $x^2 < 5 \bigvee x^2 < 0$

[6] $x^2 < 5 \bigwedge x^2 < 0$

[7] $x^2 < 0 \bigvee x^2 > 0$

[8] $x^2 \leq 0 \bigwedge x^2 \geq 0$

Answers to [06-09-11-T11]

■ **A. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $-3 \le x \le 4$ [2] $x < -3 \vee x > 4$ [3] $x \le -5 \vee x \ge 3$
[4] $-5 < x < 3$ [5] $4 \le x \le 7$ [6] $x \le 4 \vee x \ge 7$

■ **B. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x < -\sqrt{5} \vee x > \sqrt{5}$ [2] $-\sqrt{5} < x < \sqrt{5}$
[3] $-7 \le x \le 7$ [4] $x \le -7 \vee x \ge 7$
[5] $-3 < x < 3$ [6] $x < -3 \vee x > 3$

■ **C. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $\{\}$ [2] $x < -7 \vee x > -7$ [3] $x < 3 \vee x > 5$
[4] $x < 3 \vee x > 5$ [5] $x < 5 \vee x > 6$ [6] $5 < x < 6$

■ **D. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $x < 1 \vee x > 3$ [2] $1 < x < 3$ [3] $\mathbb{R}$
[4] $x = 11$ [5] $\{\}$ [6] $x < -\sqrt{2} \vee x > -\sqrt{2}$

■ **E. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $\{\}$ [2] $\{\}$ [3] $x \le \frac{1}{2}\left(-1-\sqrt{21}\right) \vee x \ge \frac{1}{2}\left(-1+\sqrt{21}\right)$
[4] $\frac{1}{2}\left(-1-\sqrt{21}\right) < x < \frac{1}{2}\left(-1+\sqrt{21}\right)$ [5] $\frac{1}{4}\left(-1-\sqrt{17}\right) < x < \frac{1}{4}\left(-1+\sqrt{17}\right)$
[6] $x \le \frac{1}{4}\left(-1-\sqrt{17}\right) \vee x \ge \frac{1}{4}\left(-1+\sqrt{17}\right)$

■ **F. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $\mathbb{R}$ [2] $\mathbb{R}$ [3] $x \le 1 \vee x \ge 3$
[4] $\emptyset$ [5] $\emptyset$ [6] $\mathbb{R}$

■ **G. Find all $x \in \mathbb{R}$ that satisfy the given conditions.**

[1] $\mathbb{R}$ **[2]** $x = 0$ **[3]** $\emptyset$
[4] $-\sqrt{5} < x < 0 \bigvee 0 < x < \sqrt{5}$
[5] $-\sqrt{5} < x < \sqrt{5}$ **[6]** $\emptyset$
[7] $x < 0 \vee x > 0$ **[8]** $x = 0$