

Solving Quadratic Inequalities in One Variable

Quadratic inequalities in one variable are inequalities which can be written in one of the following forms, where a , b , and c are real numbers:

$$ax^2 + bx + c > 0 \quad ax^2 + bx + c < 0 \quad ax^2 + bx + c \geq 0 \quad ax^2 + bx + c \leq 0$$

To solve a quadratic inequality, follow these steps:

STEP 1 Replace the inequality symbol with an equal sign.

STEP 2 Move all terms to one side and set equal to 0.

STEP 3 Solve the quadratic equation using square roots, factoring, or the quadratic formula.

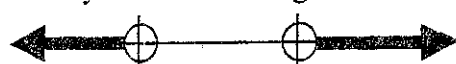
STEP 4 Draw a number line. Place the answers on the number line using **open circles** or **closed circles**.

Use **open circles** for the symbols $<$ or $>$.

Use **closed circles** for the symbols \leq or \geq .

STEP 5 Test an x -value in each section of the number line using the **inequality**. Shade the section(s) of the number line that make a true statement.

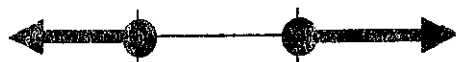
STEP 6 Write your answer using one of the following inequalities:



$$x < \underline{\quad} \quad \text{OR} \quad x > \underline{\quad}$$



$$\underline{\quad} < x < \underline{\quad}$$



$$x \leq \underline{\quad} \quad \text{OR} \quad x \geq \underline{\quad}$$



$$\underline{\quad} \leq x \leq \underline{\quad}$$

EXAMPLE 1 $x^2 > x + 2$

EXAMPLE 2 $x^2 - 5x \leq -4$

EXAMPLE 3 $2x^2 + 13x < -6$

EXAMPLE 4 $3x^2 \geq 13x + 10$

Name: _____

Date: _____

Solving Quadratic Inequalities

Find the solution set for each inequality:

1. $x^2 - x - 12 < 0$

2. $3x^2 + 2x > 1$

3. $x^2 - 16 \geq 0$

4. $5x^2 - 4x - 1 > 0$

5. $x^2 - 2x - 35 \geq 0$

6. $x^2 - 5x + 6 < 0$

$$7. 2x^2 + 5x \geq 3$$

$$8. 3x^2 > -14x + 5$$

$$9. x^2 < -4x + 21$$

$$10. 6x^2 < -5x + 1$$

$$11. 2x^2 > -x + 15$$

$$12. 2x^2 + 11x + 5 < 0$$

Steps to Graphing Inequalities in standard form

- Find the vertex $(\frac{-b}{2a}, \text{plug in to get } y)$
- Decide if the graph opens up or down
 - If a is negative, it opens down
- Pick 2 x -values on each side of axis of symmetry. Plug x -value in equation to get y -value.

Steps to Graphing Inequalities in standard form

- Graph as above like an equation
- Change solid line to dashed if $>$ or $<$
- Shade region **above** the vertex if $>$ or \geq
Shade region **below** the vertex if $<$ or \leq

example

$$y \leq -3x^2 - 6x + 3$$

1. Find vertex: $\frac{-(-6)}{2(-3)} = -1$

$$y = -3(-1)^2 - 6(-1) + 3$$

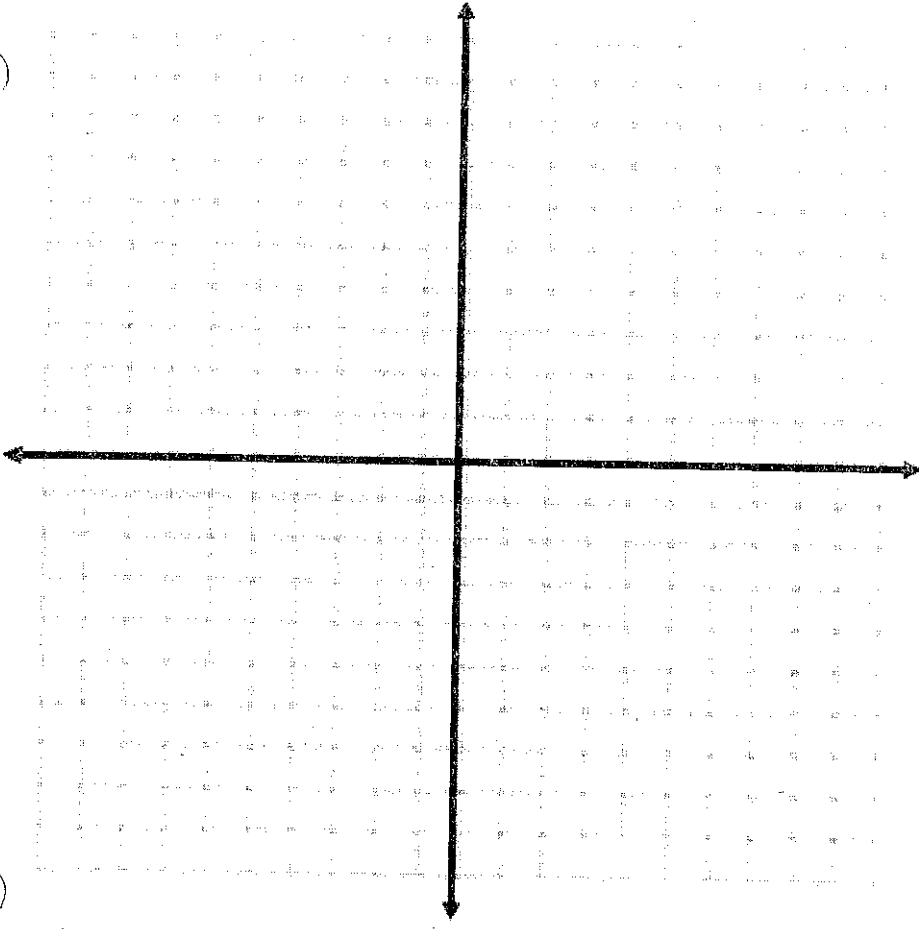
$$y = 6$$

Vertex $(-1, 6)$

2. Pick 2 x-values on each side of axis of symmetry. Plug in each x to find a value for y.

3. Use solid line for \leq

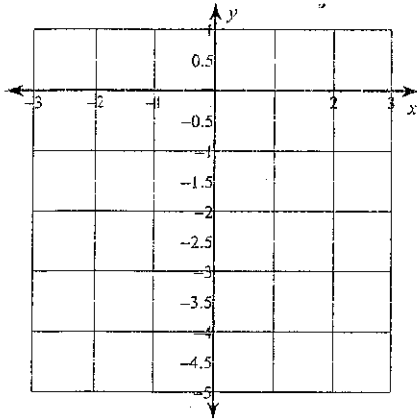
4. Shade region below the vertex for \leq



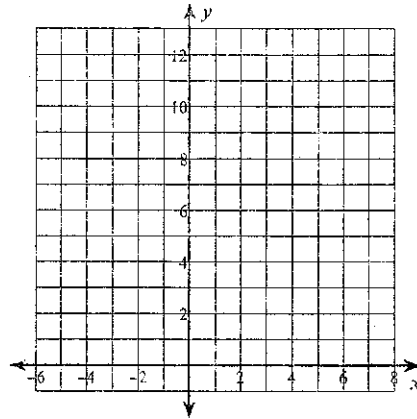
Graphing Quadratic Inequalities

Sketch the graph of each function.

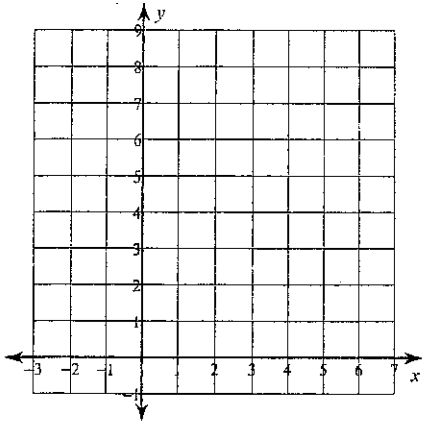
1) $y > -x^2$



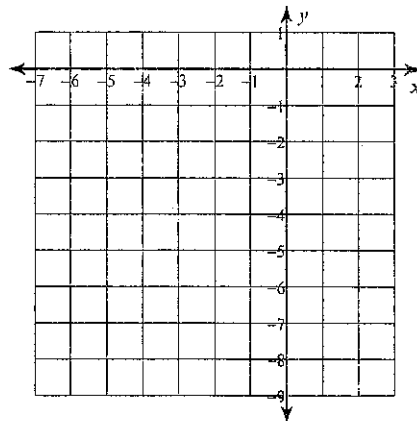
2) $y \geq 3x^2$



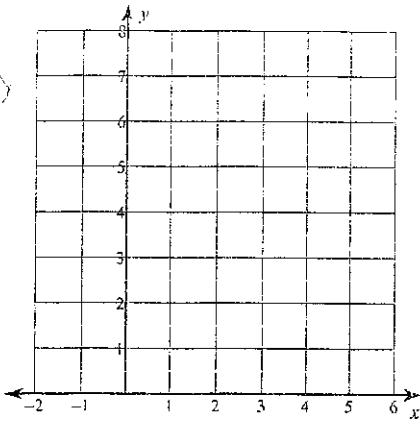
3) $y > 2x^2$



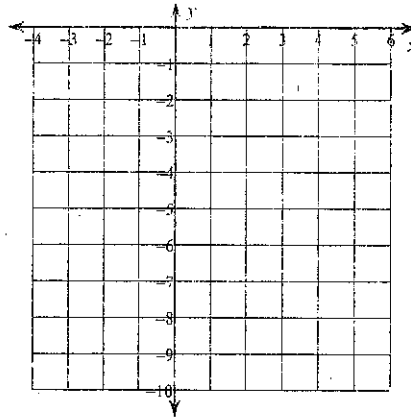
4) $y \geq -2x^2$



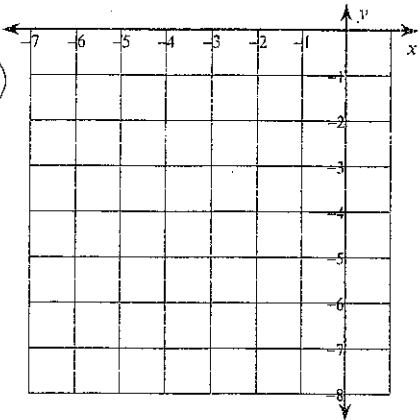
5) $y \leq x^2 - 6x + 12$



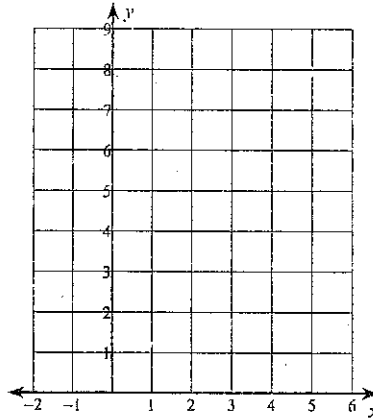
6) $y < -2x^2 - 8x - 9$



7) $y < -x^2 - 6x - 12$



8) $y \geq x^2 - 6x + 13$



Quadratic Inequalities

Determine whether the given ordered pair is a solution of each inequality.

a. $y \geq x^2$
(0, 4)

b. $y < -x^2 + 6x$
(6, -5)

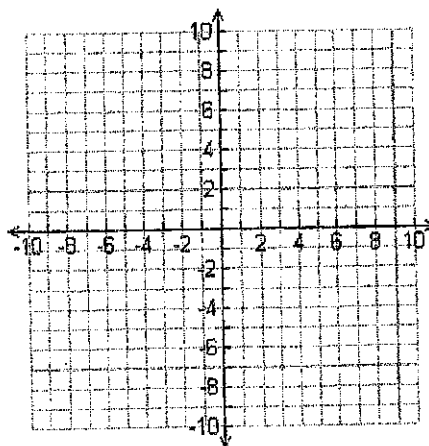
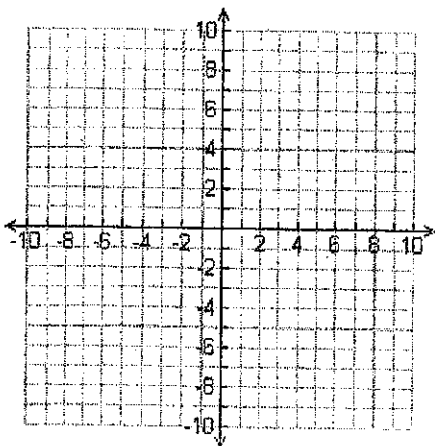
c. $y \geq 2x^2 + 3x + 2$
(-3, 4)

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Graph each inequality.

a. $y \geq x^2 + 2x - 2$

b. $y > -x^2 + 2x + 2$

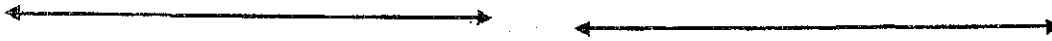


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Solve each inequality algebraically.

a. $x^2 + 2x \leq 3$

b. $2x^2 + 3x > 5$



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Quadratic Inequalities

Name _____
 Period _____

#1-3 Determine whether the ordered pair is a solution of the inequality. Show your work then answer yes or no.

1. $y < x^2 - 2x + 4$, (1,2)

2. $y > 2x^2 + x - 5$, (-2,1)

3. $y \leq -2x^2 + 5x + 6$, (4,-4)

#4-9 Match the inequality with its graph.

_____ 4. $y \geq -x^2 + 4x - 3$

_____ 5. $y \leq -x^2 - 4x - 3$

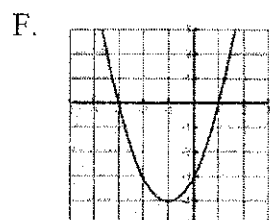
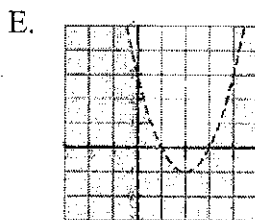
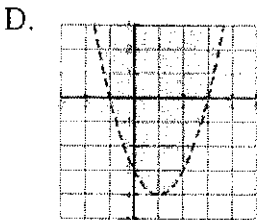
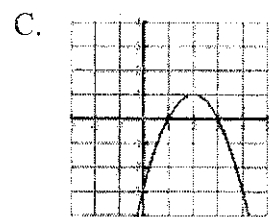
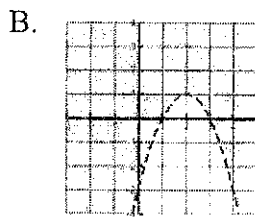
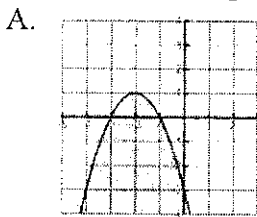
_____ 6. $y \leq x^2 + 2x - 3$

_____ 7. $y < x^2 - 4x + 3$

_____ 8. $y > -x^2 + 4x - 3$

_____ 9. $y > x^2 - 2x - 3$

Use A-F to match with quadratic inequalities #4-9.



#10-12 Solve each quadratic inequality algebraically, then graph the solution on a number line.

10. $x^2 - 2x - 15 < 0$

11. $x^2 + 7x + 12 \geq 0$

12. $3x^2 + 4 \leq 7x$

#13-15 Graph each quadratic inequality.

13. $y \leq x^2 - 6x + 8$

14. $y \leq -x^2 + 6x - 7$

15. $y > 2x^2 - 4x - 6$

