Key

Section 4.8 Notes Day 2

Objectives: Solve Quadratic Inequalities.

Quadratic Inequalities in one variable can be solved using the graphs of the related quadratic functions.

$ax^2 + bx + c < 0$

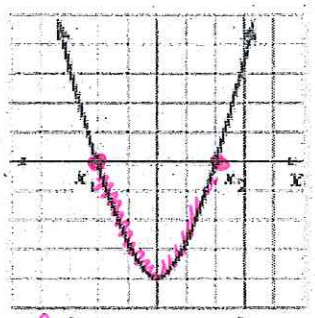
Graph $y = ax^2 + bx + c$ and identify the x-values for which the graph lies **below** the x-axis.

For ≤ include the x-intercepts in the solution.

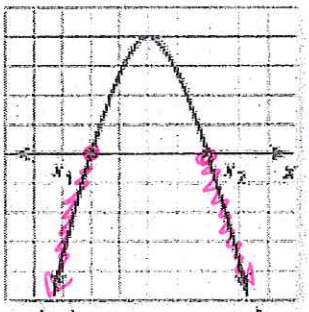
$ax^2 + bx + c > 0$

Graph $y = ax^2 + bx + c$ and identify the x-values for which the graph lies **above** the x-axis.

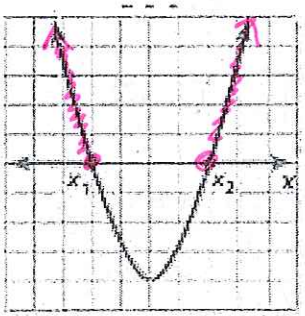
For ≥ include the x-intercepts in the solution.



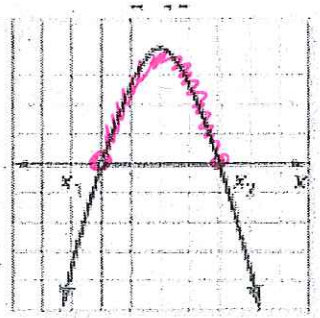
$[x \mid x_1 \le x \le x_2]$ (x_1, x_2)



$[x \mid x < x_1 \text{ or } x > x_2]$ $(-\infty, x_1) \cup (x_2, \infty)$



$[x \mid x < x_1 \text{ or } x > x_2]$ $(-\infty, x_1) \cup (x_2, \infty)$



$[x \mid x_1 \le x \le x_2]$ (x_1, x_2)

Interval notation

EX. Solve $x^2 + 2x - 8 < 0$ by graphing.

The solution consists of the x-values for which the graph of the related function lies **below** the x-axis.
Begin by finding the roots of the related function.

$X^2 + 2x - 8 = 0$

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

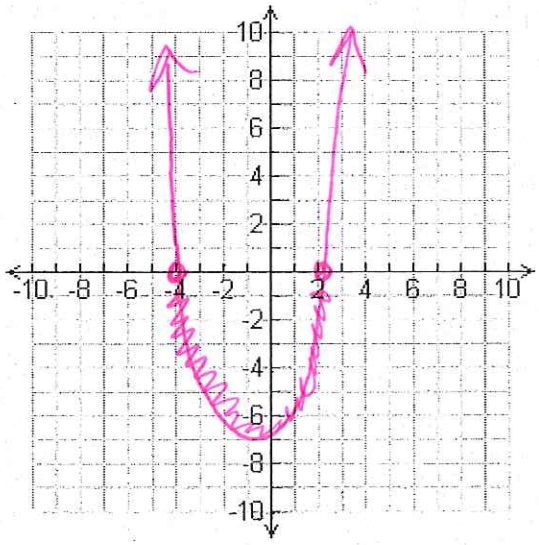
$x-4=0 \quad x-2=0$

$x=-4 \quad x=2$

vertex unimportant looking for intercepts only

Sketch the graph of a parabola that has x-intercepts at -4 and 2.
The graph should open up.

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



The graph lies below the x-axis between $x = -4$ and $x = +2$.

Thus, the solution set is $(-4, 2)$

Solve each inequality by graphing.

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

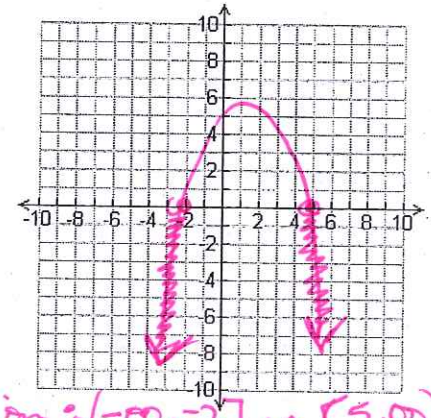
less than zero so solution lies below x axis

graph opens down.

x intercepts

$x = -2$

$x = 5$



Solution: $(-\infty, -2] \cup [5, \infty)$

2) $0 \geq x^2 + 5x - 6$

less than zero so solution lies below x axis

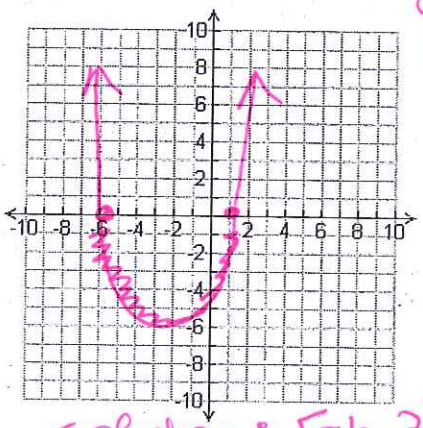
$x^2 + 5x - 6 < 0$

graph opens up

x intercepts:

$x = 1$

$x = -6$



Solution: $[-6, 1]$

3) $x^2 - 3x \leq 18$

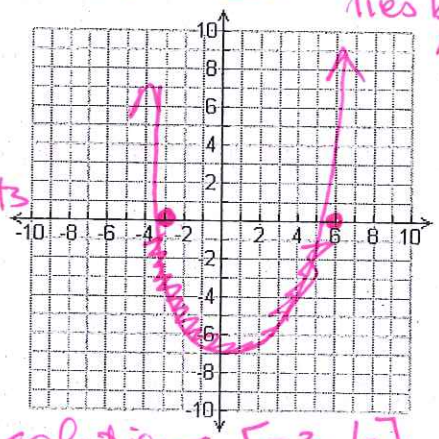
$x^2 - 3x - 18 \leq 0$ solution lies below x axis

graph opens up

x intercepts

$x = -3$

$x = 6$



solution: $[-3, 6]$

4) $x^2 + 11x \geq -30$

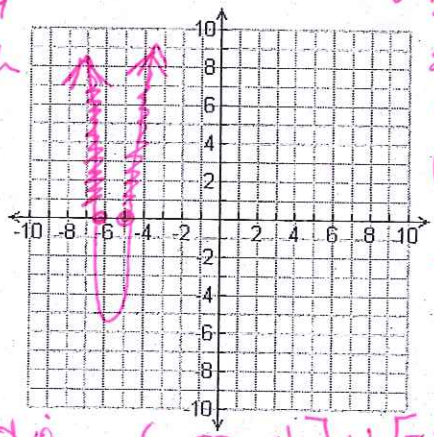
$x^2 + 11x + 30 \geq 0$ greater than zero so solution lies above x axis

graph opens up

intercepts:

$x = -5$

$x = -6$



Solution $(-\infty, -6] \cup [-5, \infty)$

5) $x^2 + 5x < -6$

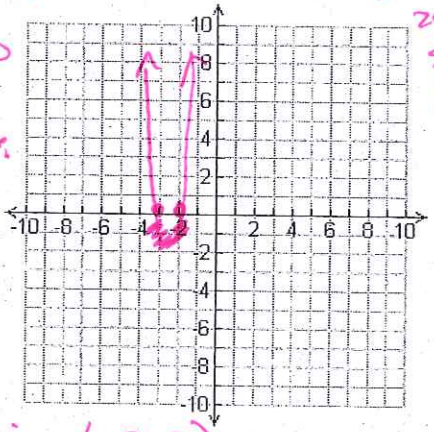
$x^2 + 5x + 6 < 0$ less than zero so solution lies below x axis

graph opens up

intercepts:

$x = -2$

$x = -3$



Solution $(-3, -2)$

* means for any x value between -3 & -2, the equation will be true

6) $x^2 - 2x - 24 > 0$

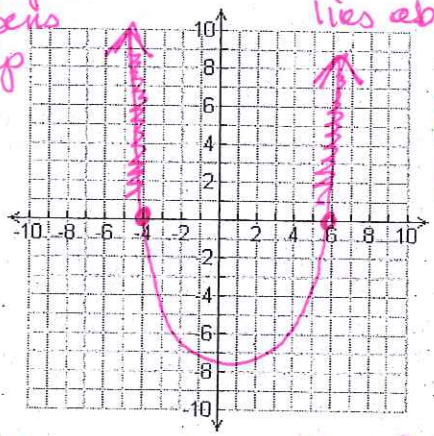
greater than zero so solution lies above x axis.

graph opens up

x int:

$x = -4$

$x = 6$



$(-\infty, -4) \cup (6, \infty)$

Solution

* means for any x value smaller than -4 or any value greater than 6 will make the inequality true.