Algebra 2 4.8 $y = x^2 + 3$ $y \leq$ $y \geq$

Graph quadratic inequalities (in two variables)

Solve quadratic inequalities (in one variable)

related function

test point

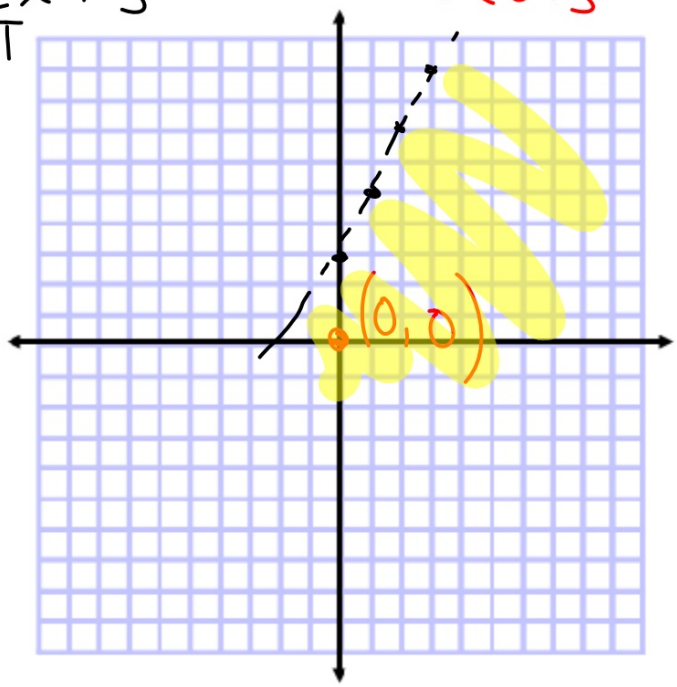
quadratic

quadratic inequality

$y = 2x + 3$

$y < 2x + 3$

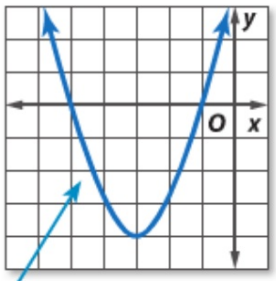
$0 < 0 + 3$



1 Graph Quadratic Inequalities

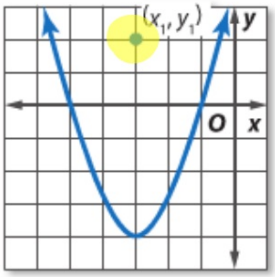
You can graph **quadratic inequalities** in two variables by using the same techniques used to graph linear inequalities in two variables.

Step 1 Graph the related function.



Should the parabola be solid or dashed?

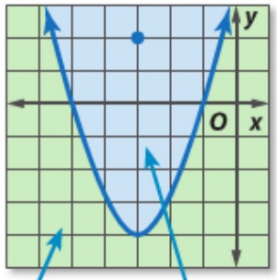
Step 2 Test a point not on the parabola.



$y_1 \geq a(x_1)^2 + b(x_1) + c$

Is (x_1, y_1) a solution?

Step 3 Shade accordingly.



(x_1, y_1) is a solution.

(x_1, y_1) is not a solution.

GuidedPractice

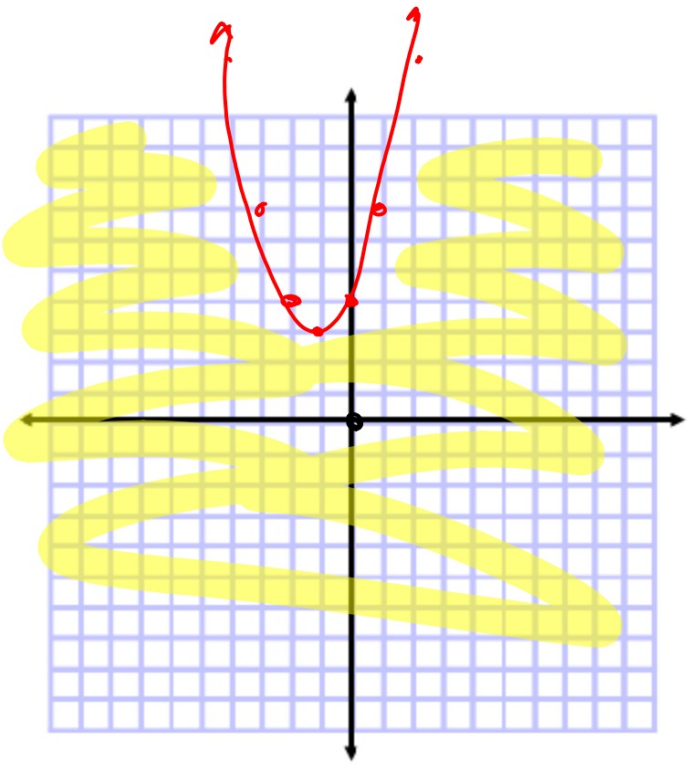
Graph each inequality.

1A. $y \leq x^2 + 2x + 4$

$y - y' = x^2 + 2x + 1$

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

$y = (x+1)^2 + 3$



$0 < 0 + 0 + 5$

1B. $y < -2x^2 + 3x + 5$

$-\frac{18}{16}$

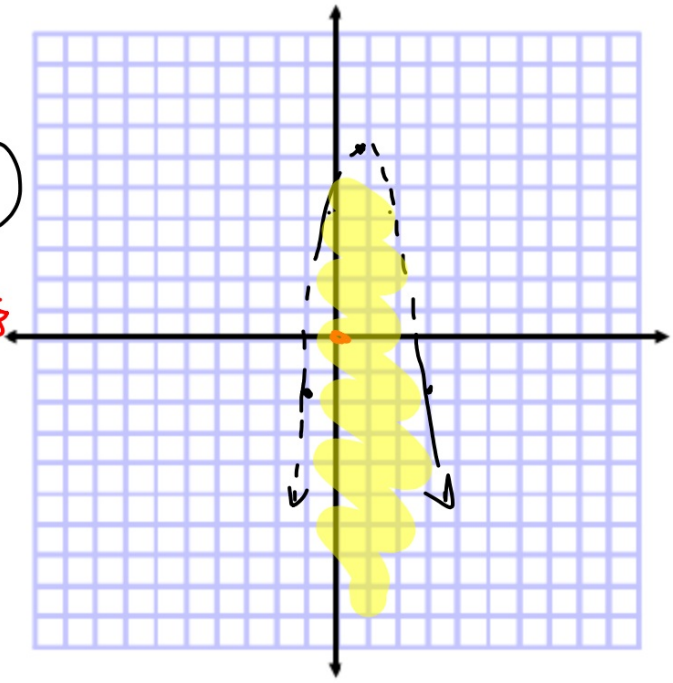
$y - 5 = -2\left(x^2 - \frac{3}{2}x + \frac{9}{16}\right)$

$y - 6\frac{1}{8} = -2\left(x - \frac{3}{4}\right)^2 + 6\frac{1}{8}$

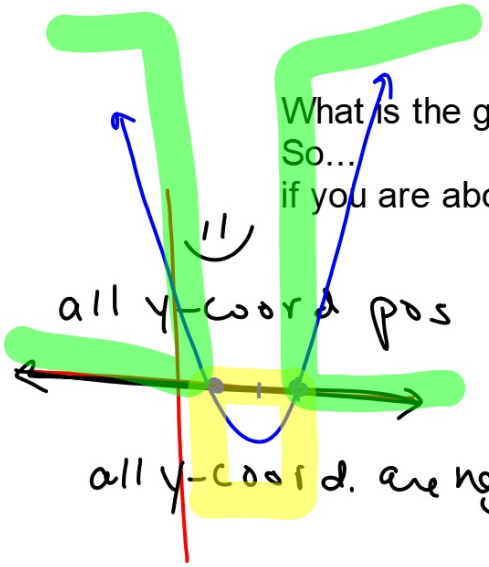
$+6\frac{1}{8}$

$y = -2\left(x - \frac{3}{4}\right)^2 + 6\frac{1}{8}$

$V\left(\frac{3}{4}, 6\frac{1}{8}\right)$



whiteboards



What is the graph of y=0 ?
So...
if you are above that line...

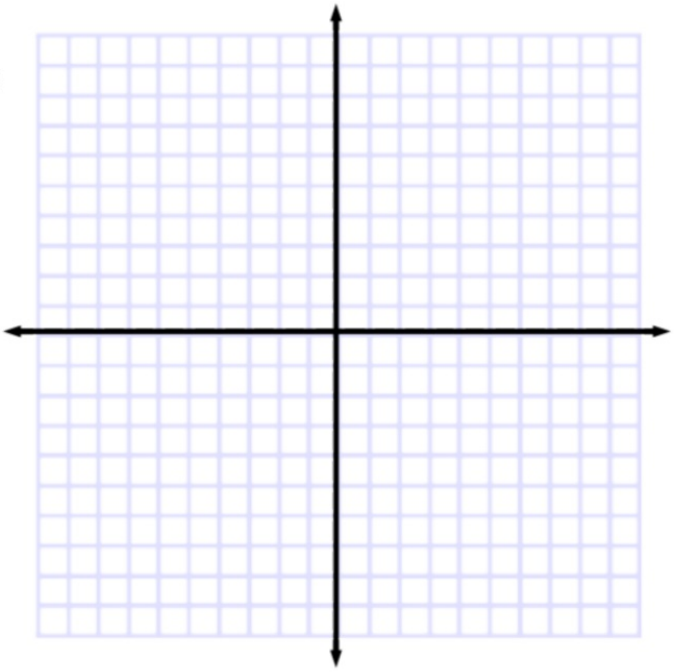
< 0 when $1 < x < 3$.

> 0 when $x < 1$

$x > 3$

Equation related function

Where is the parabola above the x-axis? (y is positive)
Where is the parabola below the x-axis? (y is negative)



Shade between or shade outside…

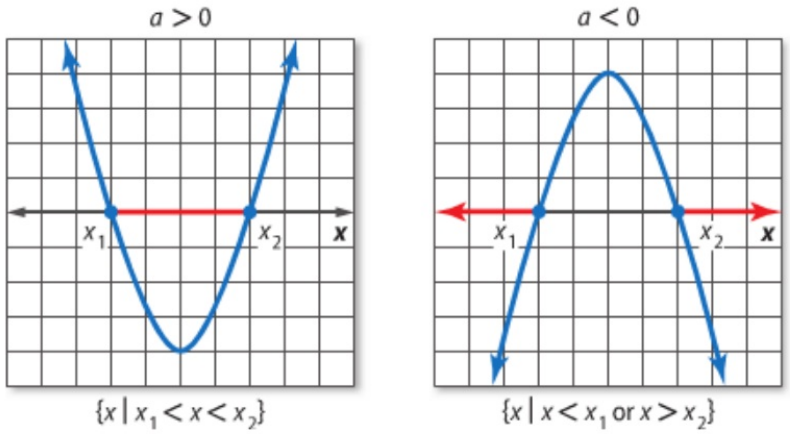
2 Solve Quadratic Inequalities

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.

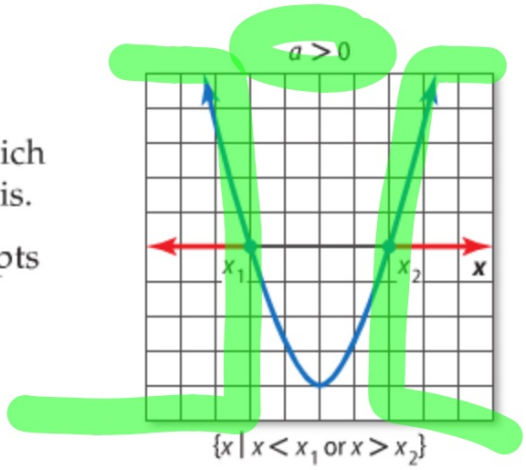
For $\leq$, include the x-intercepts in the solution.



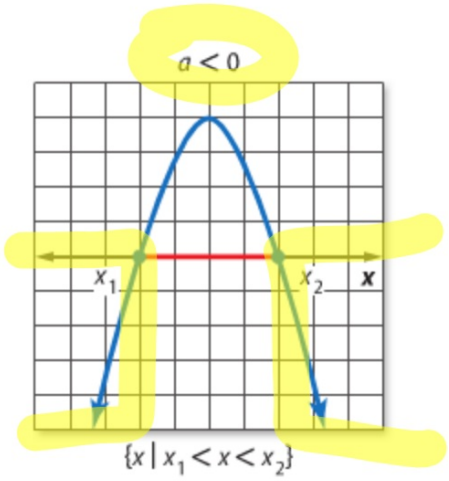
$ax^2 + bx + c > 0$

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

For $\geq$, include the x-intercepts in the solution.



Where is y positive?
negative?



Where is y positive?
negative?

topls...revealer

How is this equation different?

Example 2 Solve $ax^2 + bx + c < 0$ by Graphing

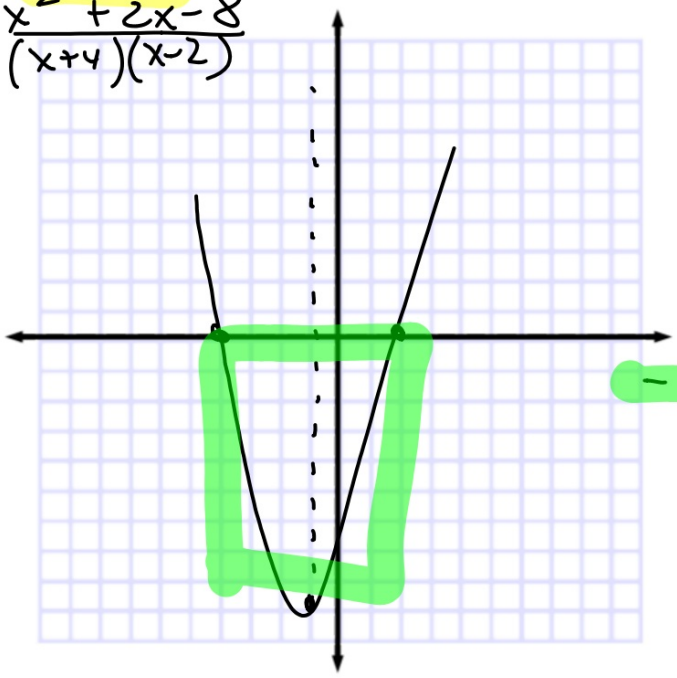
Solve $x^2 + 2x - 8 < 0$ by graphing.

negative

$\frac{-2}{2} = -1$

$y = \frac{x^2 + 2x - 8}{(x+4)(x-2)}$

-8, 4×-2, 2



$-4 < x < 2$

vertex
roots= x-int (crossing points)
direction
above/below (when x is...)
answer the question
(your answer is only about x)

$-1 \cdot -1 + 2 \cdot -1 - 8$

$1 - 2 - 8$

$\therefore$

GuidedPractice

Solve each inequality by graphing.

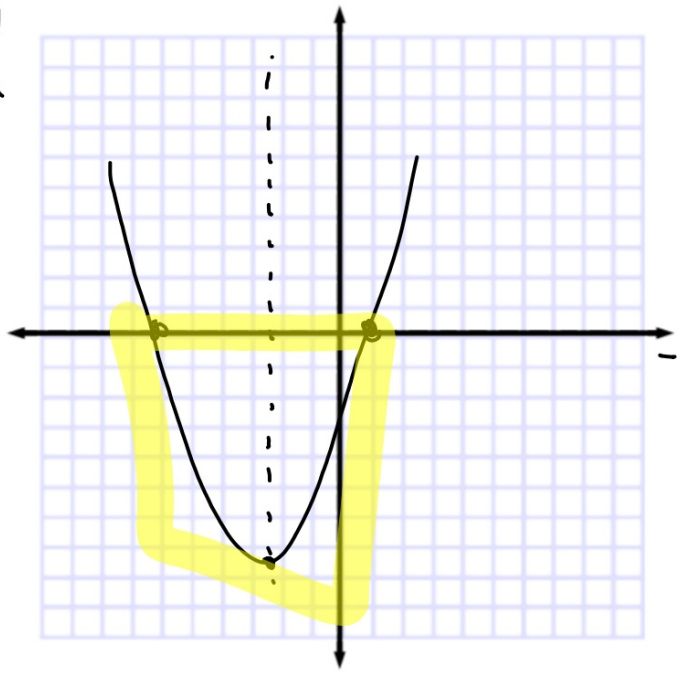
2A. $y = x^2 + 5x - 6 \leq 0$ negative

$(x+6)(x-1)$

-6, 1

6, -1, 5

$\frac{-5}{2}$

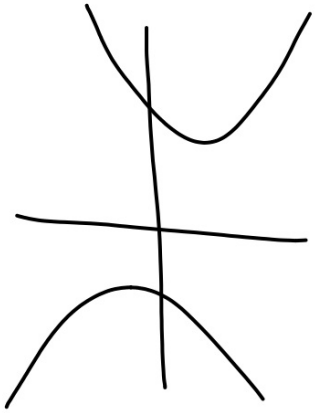


$-2.5 \cdot -2.5 + 5 \cdot -2.5 - 6$

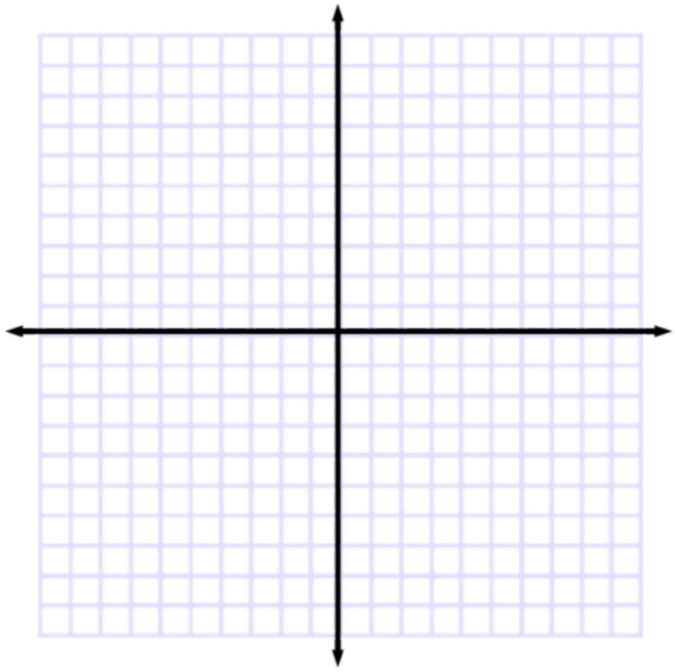
$6.25 + -7.5 - 6$

$-6 \leq x \leq 1$

vertex
roots (x-int)
direction
above/below "when x is..."
answer the question



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



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CCSS **SENSE-MAKING** **Solve each inequality by graphing.**

4. $0 < x^2 - 5x + 4$

5. $x^2 + 8x + 15 < 0$