

## 6.7 Graphing & Solving Quadratic Inequalities

**Objective:** Graph quadratic inequalities in 2 variables.  
Solve quadratic inequalities in 1 variable.

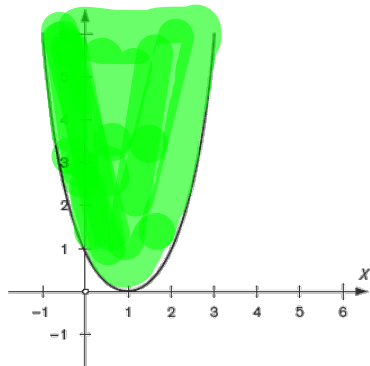
### See page 329

Step one: Graph the related quadratic equation,  $y = ax^2 + bx + c$ .  
Decide if the parabola should be solid or dashed.

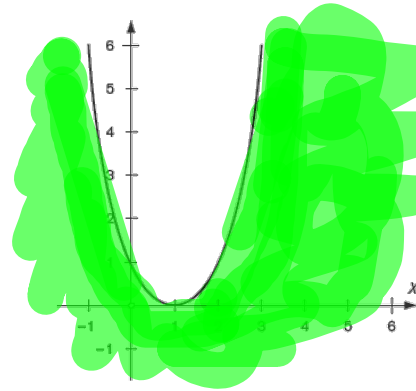
Step two: Test a point  $(x,y)$  inside the parabola. Check to see if this point is a solution of the inequality.

Step three: If  $(x,y)$  is a solution, shade the region inside the parabola. If  $(x,y)$  is not a solution, shade the region outside the parabola.

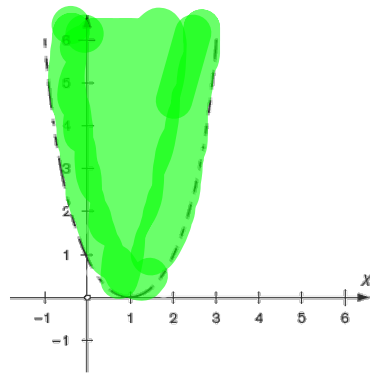
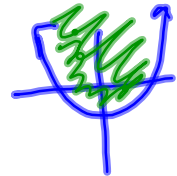
**All Reals & No Solution**



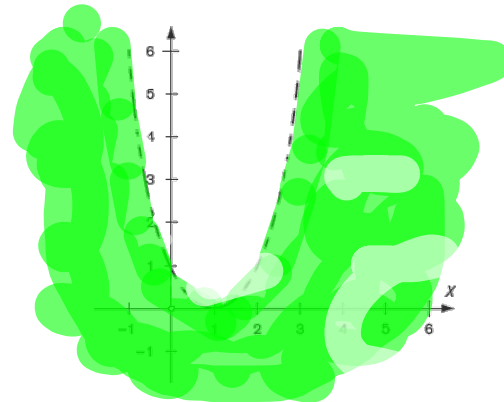
$0 \geq (x - 1)^2$       **$x = 1$**



$0 \leq (x - 1)^2$      **All reals**

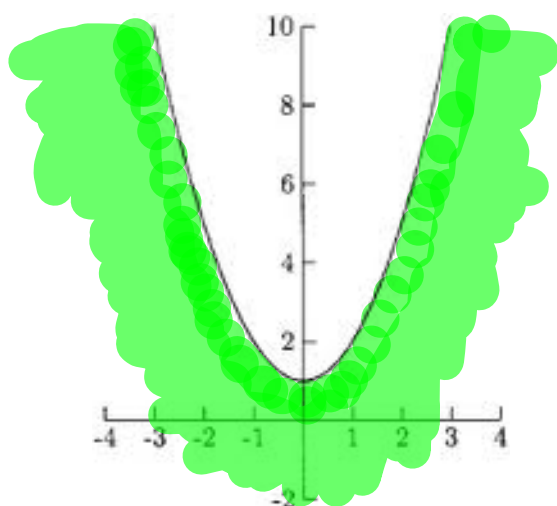


$0 > (x - 1)^2$   
**No Solution**



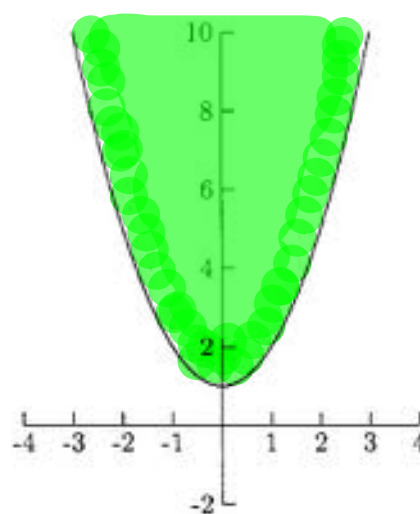
$0 < (x - 1)^2$   
**All reals except  $x = 1$**

More All Reals & No Solutions



$$0 \leq x^2 + 1$$

**All Reals**



$$0 \geq x^2 + 1$$

**No solution**

I. Graph a quadratic inequality.

$<, >$  = dotted  $\leq, \geq$  = solid

Ex1)  $y > x^2 - 6x - 7$  down

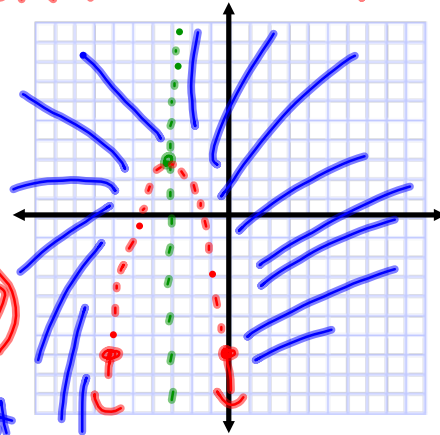
Vertex  $(-3, 2)$

$x = \frac{-b}{2a} = \frac{6}{2(1)} = -3$

$-(-3)^2 - 6(-3) - 7$   
 $-9 + 18 - 7 = 2$

y-int  $(0, c) = (0, -7)$

Shading (0,0) Test  
 $0 > -0^2 - 6(0) - 7$   
 $0 > -7$  True



Ex2)  $y > x^2 - 3x + 2$  up

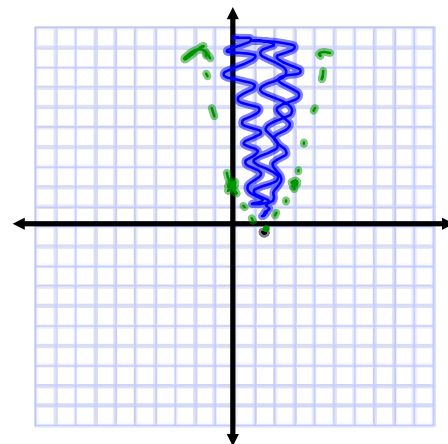
Vertex:  $x = \frac{-b}{2a} = \frac{3}{2 \cdot 1} = \frac{3}{2}$   $(\frac{3}{2}, \frac{-1}{4})$

$(\frac{3}{2})^2 - 3 \cdot \frac{3}{2} + 2$

$\frac{9}{4} - \frac{9 \cdot 2}{2 \cdot 2} + 2 = \frac{9}{4} + \frac{2 \cdot 4}{1 \cdot 4} = \frac{-1}{4}$

y-int  $(0, 2)$

Shading (0,0) Test  
 $0 > 0^2 - 3(0) + 2$   
 $0 > 2$  False



II. Solve by Graphing

Ex3)  $x^2 + 2x - 3 > 0$

Vertex:  $x = \frac{-b}{2a} = \frac{-2}{2(1)} = -1$  (-1, -4)

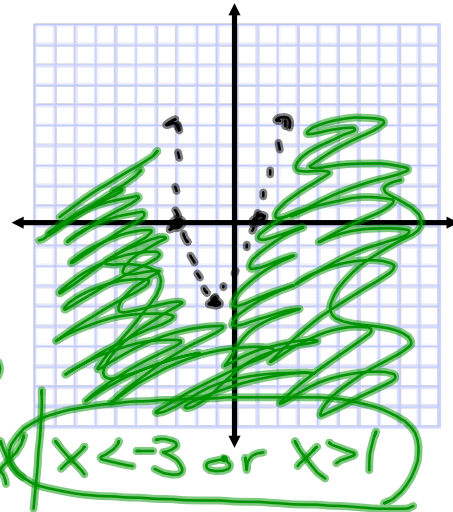
$(-1)^2 + 2(-1) - 3 = -4$

$x^2 + 2x - 3 = 0$

$(x+3)(x-1) = 0$

$x+3=0$     $x-1=0$   
 $x = -3$     $x = 1$

Test (0,0)  
 $0^2 + 2(0) - 3 > 0$   
 $-3 > 0$   
 False



Ex4)  $0 > 3x^2 - 7x - 1$

Vertex  
 $x = \frac{-b}{2a} = \frac{7}{2(3)} = \frac{7}{6}$  ( $\frac{7}{6}, -5.083$ )

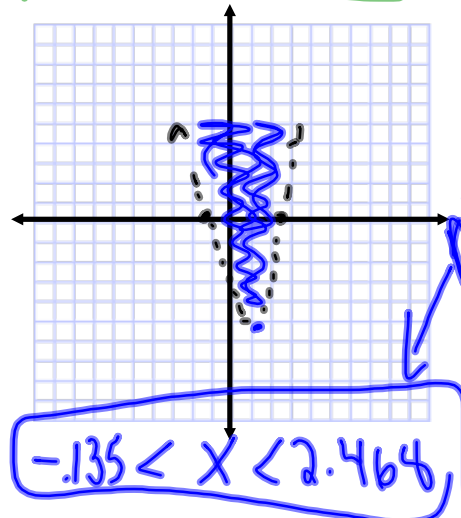
$3(\frac{7}{6})^2 - 7(\frac{7}{6}) - 1 =$

zeros

$3x^2 - 7x - 1 =$  does not factor

from calc:  $x \approx -1.35$

$x \approx 2.468$



Test (0,0)  
 $0 > 3(0)^2 - 7(0) - 1$   
 $0 > -1$  yes

Answer

Answer

III. Solve Algebraically

Ex5)  $x^2 + x > 6$

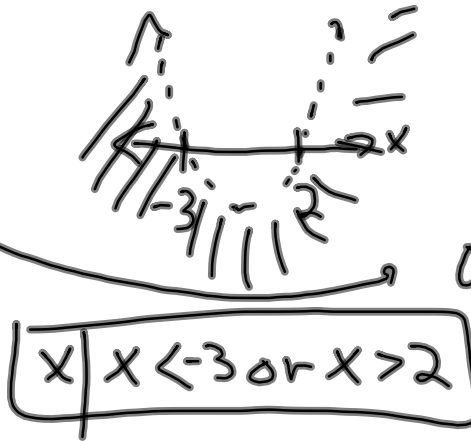
$x^2 + x - 6 > 0$

$(x+3)(x-2) = 0$

$x+3=0$      $x-2=0$

$x = -3$

$x = 2$



Test (0,0)  
 $0^2 + 0 - 6 > 0$   
 $-6 > 0$   
 NO

Ex6)  $x^2 + x \leq 2$

$x^2 + x - 2 \leq 0$

$x^2 + x - 2 = 0$

$(x+2)(x-1) = 0$

$x = -2$      $x = 1$



Test (0,0)

$0^2 + 0 - 2 \leq 0$   
 $-2 \leq 0$   
 yes

$x | -2 \leq x \leq 1$