

## #7 Graphing Parabolas

9/14/15

- ① y intercept
- ② x intercepts, roots, zeros, solutions
- ③ vertex (max or min)
- ④ axis of symmetry
- ⑤ Domain + Range

① y intercept - where the parabola crosses the y axis

Standard Form  
 $ax^2 + bx + c = y$



c is the y intercept

another format  
 $(x-h)(x-k) = y$   
 $(x+h)^2 + k = y$

to find y intercept  
 plug in  $x=0$   
 and simplify

② x intercepts - where the parabola crosses the x-axis are also called zeros, solutions, roots,

Standard Form  
 $ax^2 + bx + c = y$



Factor first or  
 Solve with  
 Quadratic Formula

factored form  
 $2(x-1)(x+3) = y$

to find x intercepts  
 set each parenthesis  
 equal to zero and solve

③ vertex - (maximum or minimum)

Standard Form  
 $ax^2 + bx + c = 0$

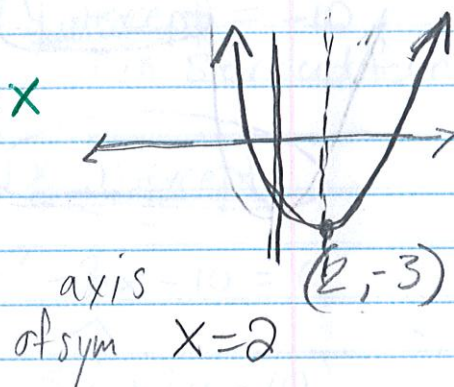
x value of the vertex  
 $= \frac{-b}{2a}$

max opens down  
 min opens up

④ axis of symmetry - since parabolas are symmetrical (even on both sides) the vertical line of symmetry goes through vertex

x value of vertex  $\rightarrow \frac{-b}{2a} = x$

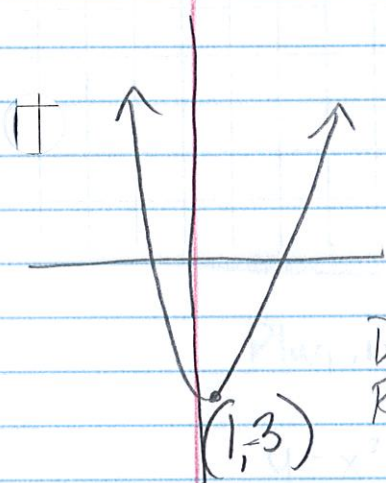
Standard Form  $\nearrow$



⑤ Domain + Range:

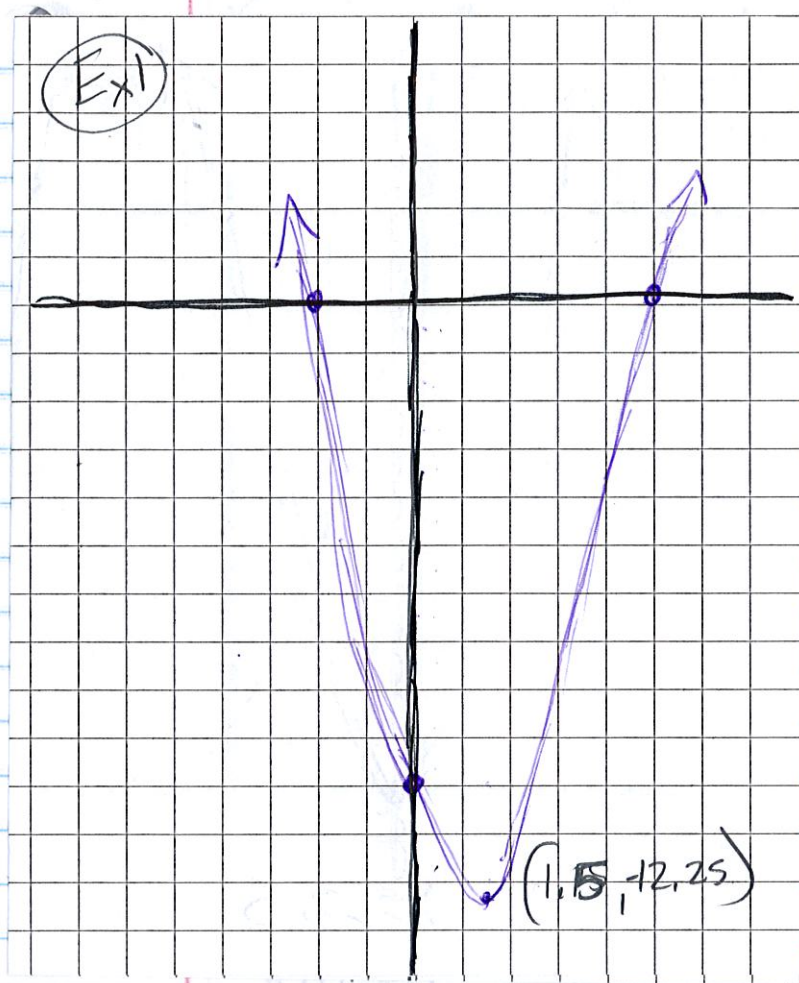
Domain are all x values where the graph exists

Range are all y values where the graph exists



Domain  $(-\infty, \infty)$ , all Real #'s  
Range  $[-3, \infty)$ ,  $y \geq -3$

(Ex)



(Ex1)  $y = x^2 - 3x - 10$

(1) y intercept = -10  
in standard form

(2) x intercepts

$$x^2 - 3x - 10 = 0 \quad \begin{array}{l} -10 \quad -3 \\ \phantom{-} \quad \phantom{-} \end{array}$$

$$x^2 - 5x + 2x - 10 = 0$$

$$x(x-5) + 2(x-5) = 0$$

$$(x+2)(x-5) = 0$$

$$x+2=0 \quad x-5=0$$

$$\begin{array}{l} -2 \quad -2 \\ \phantom{-} \quad \phantom{-} \end{array} \quad \begin{array}{l} +5 \quad +5 \\ \phantom{-} \quad \phantom{-} \end{array}$$

$x = -2$

$x = 5$

(3) Vertex

Plug in  $x=1.5$ , and solve for y

$$y = x^2 - 3x - 10$$

$$(1.5)^2 - 3(1.5) - 10$$

$$2.25 - 4.5 - 10 = -12.25$$

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

$$x = 1.5$$

Vertex  $(1.5, -12.25)$

(4) axis symmetry is  $x = 1.5$

(5) Domain:  $(-\infty, \infty)$   
All Real #'s

Range:  $[-12.25, \infty)$  OR  $y \geq -12.25$

Ex2  $x^2 + 7x = y$   $ax^2 + bx + c = y$

y intercept  $(0, 0)$

x intercepts  $x^2 + 7x = 0$

when there is no C value Factor out GCF

$x(x+7) = 0$   
 $x = 0$  or  $x = -7$

vertex

$x = \frac{-b}{2a} = \frac{-7}{2(1)} = \frac{-7}{2} = -3.5$  plug in  $x = -3.5$  to find y

axis of sym

$(-3.5)^2 + 7(-3.5) = y$   
 $12.25 - 24.5 = y$   
 $y = -12.25$

Domain

All Real #'s

Range

$y \geq -12.25$

Vertex  $(-3.5, -12.25)$

Ex3  $x^2 + 10x + 25 = y$   $ax^2 + bx + c = y$

y intercept  $(0, 25)$

x intercepts  $x^2 + 10x + 25 = 0$

$x^2 + 5x + 5x + 25 = 0$

$x(x+5) + 5(x+5)$

$(x+5)(x+5) \rightarrow x+5 = 0$

$x = -5$

vertex

axis of sym

$x = \frac{-b}{2a} = \frac{-10}{2(1)} = -5$

$x = -5$

Domain + Range

Domain: All Real #'s

$(-\infty, \infty)$

plug in  $x = -5$  to find y

$(-5)^2 + 10(-5) + 25 = y$

$25 + -50 + 25 = y$

$0 = y$

Range  $y \geq 0$

$[0, \infty)$

Vertex  $(-5, 0)$