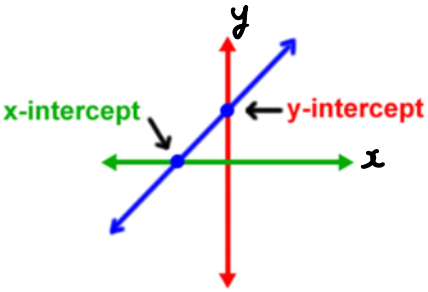
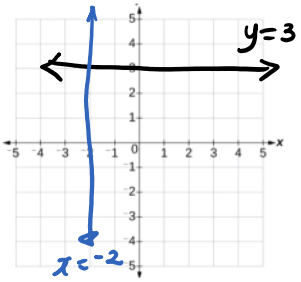
2 Exploring Quadratic Functions

September 23, 2019 6:16 PM

PreCal 11 Ch 3 Day 2: Properties of Graphs of Quadratic Functions

Today's vocab: vertex, axis of symmetry, maximum value, minimum value, horizontal distance, height, table of values, domain, range



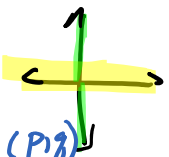


***y*-INTERCEPT:** where the graph crosses the y-axis (i.e., where x=0)

***x*-INTERCEPT:** where the graph crosses the x-axis (i.e., where y=0)
The x-intercepts are also called the zeros.

DOMAIN: the set of valid x values for the graph

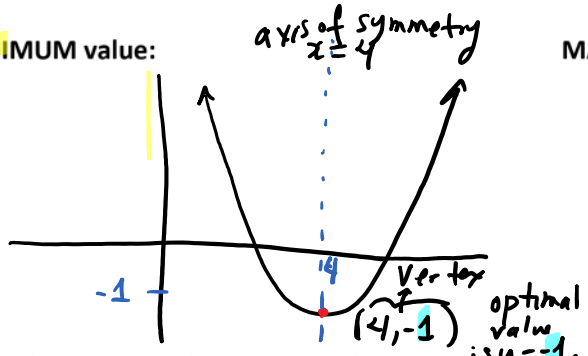
RANGE: the set of valid y values for the graph



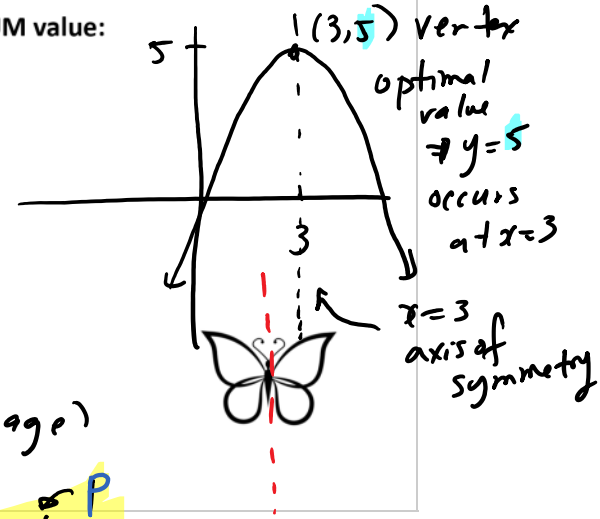
VERTEX: the minimum or maximum point, (x,y), on a parabola.

The Vertex tells us a lot! It tells us the function's OPTIMUM value, y, & when it occurs, x.

MINIMUM value:



MAXIMUM value:



AXIS of SYMMETRY (a vertical line):

- divides the parabola into 2 equal halves (mirror image)
- Show with a dashed line
- write as an equation, x = # ← P

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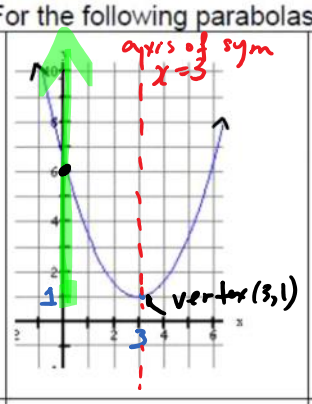
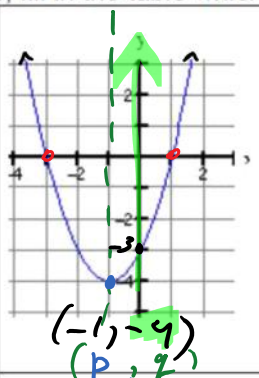
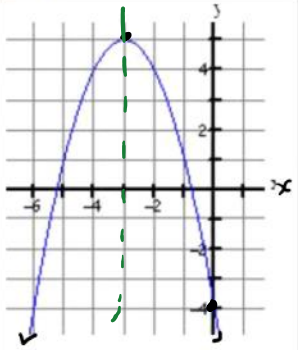
Example 1: Introducing... The Parabola! (Continued)

For the following parabolas, fill in the table which follows.

Parabola	axis of sym		

Example 1: Introducing... The Parabola (Continued)

For the following parabolas, fill in the table which follows.

Parabola Graph			
Vertex (p, q)	(3, 1)	(-1, -4)	(-3, 5)
Optimal Value q	1	-4	5
Axis of Symmetry x = p	x = 3	x = -1	x = -3
Zeroes x-intercepts	none	-3, 1	-5.2, -0.8
Direction of Opening	up ∨	up ∨	Down ∧
Y – intercept	6	-3	-4
Domain always R if arrows!	{x | x ∈ R} is	{x | x ∈ R}	{x | x ∈ R}
Range ∨ y ≥ q min ∧ max y ≤ q	{y | y ≥ 1, y ∈ R}	{y | y ≥ -4, y ∈ R}	{y | y ≤ 5, y ∈ R}

True or False... (use the above for answers)

F The axis of symmetry goes through the y – intercept. (it goes thru x-coord of vertex)

T The vertex is always located halfway between the zeroes.

T The y – coordinate (q) of the vertex is always the same as the optimal value.

T The x – coordinate of the vertex is always the same as the axis of symmetry. x = p

F A parabola must open up.

F The y – intercept is always positive.

How to find the equation of the AXIS of SYMMETRY

★ If you have the vertex, then $x = p$
(p, q)

★ If you have the quadratic equation in standard form, $y = ax^2 + bx + c$, then

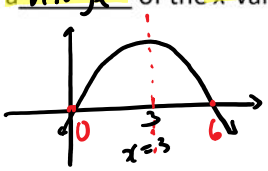
Ex: $y = 1x^2 + 3x - 10$
$a = 1, \ b = 3$

$$x = \frac{-b}{2a}$$

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

$x = -\frac{3}{2}$

★ If you have 2 *x*-intercepts (or 2 points with the same *y*-values), then take the average of the *x*-values.



avg: $\frac{0+6}{2} = \frac{6}{2} = 3$

$x = 3$

Example 3: Find the **equation of the axis of symmetry** for each quadratic function given the following:

a) the vertex is (-2, 8)

$x = -2$

b) $y = -x^2 - 3x + 5$

$a = -1 \quad b = -3$

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

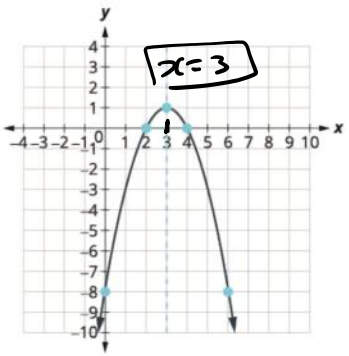
c) the x-intercepts of a quadratic are -4 and 6

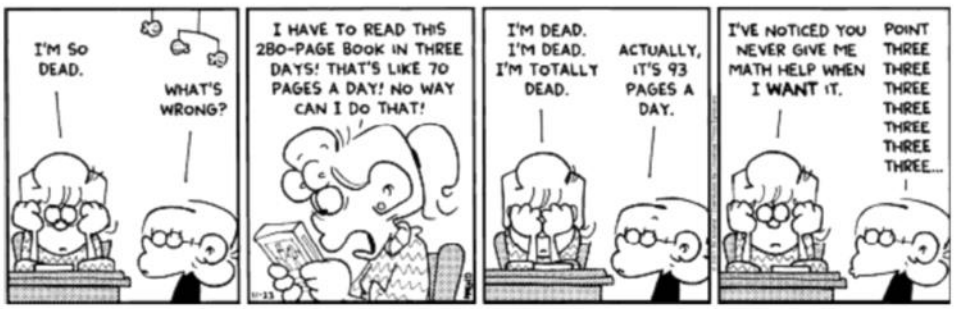
take avg!

$x = \frac{-4+6}{2} = \frac{2}{2} = 1$

$x = 1$

d)





Draw arrows!

Example 4: Sketch a parabola with:

a) the vertex of (3,4) and zeros at 1 and 5
b) a minimum value of -8, zeros at 2 and -2, and y-intercept of -8
c) a zero at (1, 0), the vertex at (3, -4) and y-intercept of (0,5)
d) the axis of symmetry of $x = -2$, optimal value of -3. This parabola has no zeros.

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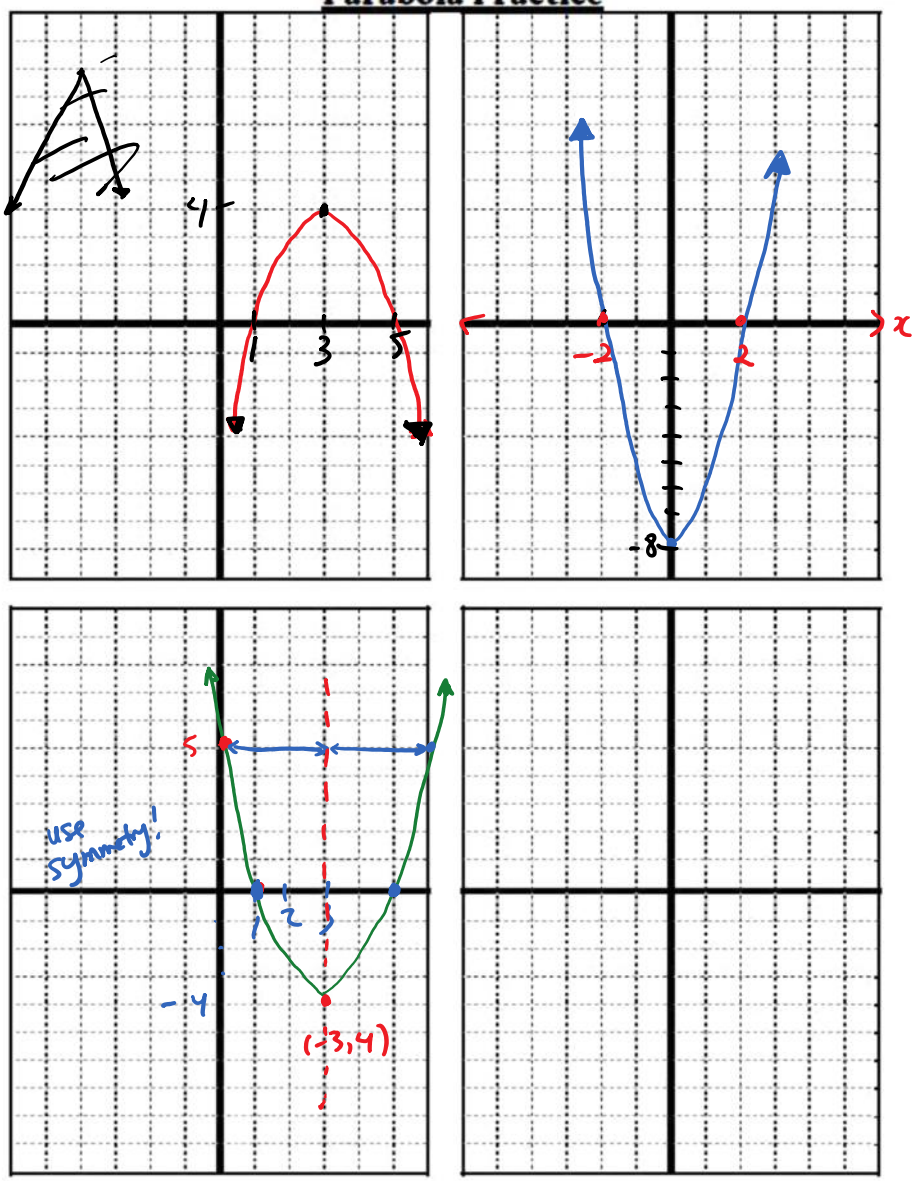
Parabola Practice



Day 2 : p.1 do at least 4!
p.2
p.3