DO NOW

Find the zeros of the function

routs

x-intercepts

Solution

$f(x) = x^2 - 6x + 9$

$0 = x^2 - 6x + 9$

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

9	-6
-3·-3	-3+-3

$x - 3 = 0$

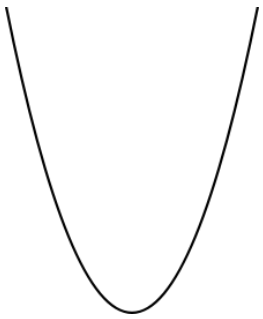
$x = 3$

Apr 14-8:29 AM

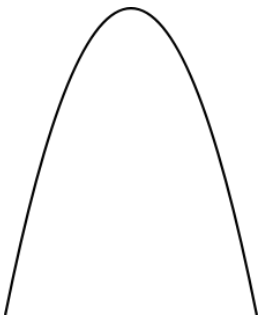
Standard form of a quadratic function

$y = ax^2 + bx + c$ *OR* $f(x) = ax^2 + bx + c$

Parabola: The graph of any quadratic function is a curve



OR



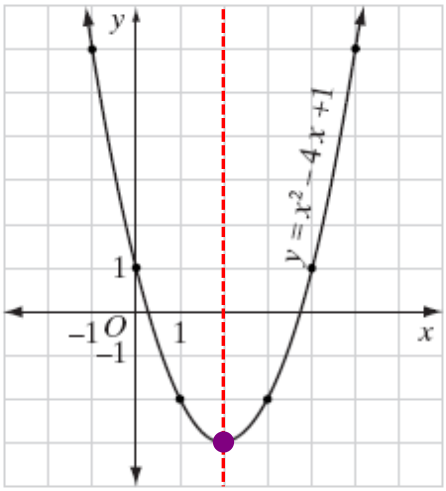
a is positive

a is negative

Apr 14-8:30 AM

Axis of Symmetry: The vertical line that separates the graph of a parabola $x = \#$ (AOS)

Vertex: The turning point of the parabola (Minimum or a Maximum) (AOS, MIN MAX)



Axis of Symmetry

x = 2

Vertex

(2, -3)

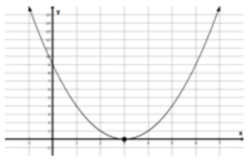
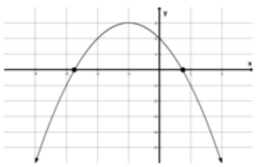
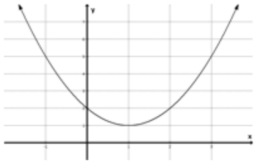
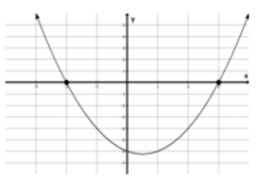
Mn = -3

Domain $(-\infty, \infty)$

Range $[-3, \infty)$

Apr 14-8:48 AM

The roots/zeros/solutions of a quadratic function are the points where the graph crosses the x-axis (x-intercepts)

Discriminant	Number of roots	Example	Graph
$b^2-4ac=0$	**1 real root** Touches ***x*** axis once	$y=x^2-6x+9$ $b^2-4ac=$ $(-6)^2-4(1)(9)=$ $36-36=\mathbf{0}$	
$b^2-4ac>0$	**2 real roots** Touches ***x*** axis twice	$y=-x^2-2x+2$ $b^2-4ac=$ $(-2)^2-4(-1)(2))=$ $4+8=\mathbf{12}$	
$b^2-4ac<0$	**No real roots** Doesn't touch ***x*** axis – no ***x***-intercepts	$y=x^2-2x+2$ $b^2-4ac=$ $(-2)^2-4(1)(2)=$ $4-8=\mathbf{-4}$	
And one more thing that's interesting: If $b^2-4ac=$ **a perfect square** (0, 1, 4, 9, 25,...)	**2 real rational** ("easy") **roots** (1 root if discriminant = 0) (We'll see later that these quadratics can be **factored**)	$y=x^2-x-6$ $b^2-4ac=$ $(-1)^2-4(1)(-6)=$ $1+24=\mathbf{25}$	

Mar 20-6:22 AM

Vertex: (-2, -4)

Axis of Symmetry:

$x = -2$

Zeros of the function:

$x = -4, 0$

Coordinates

(-4, 0)

(0, 0)

Min or Max:

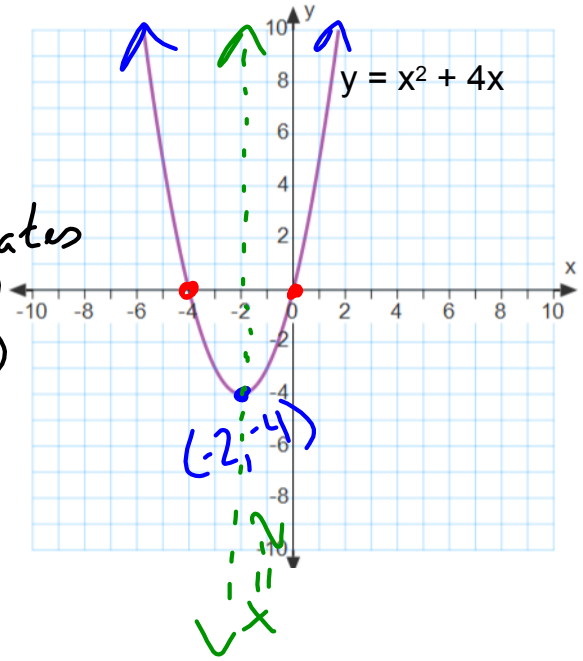
Min $y = -4$

Domain:

$(-\infty, \infty)$

Range:

$[-4, \infty)$



Mar 30-7:02 AM

Find the axis of symmetry & Vertex of the function

1) $y = x^2 - 6x + 8$

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

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

AOS

$x = 3$

Vertex

(3, -1)

$y = x^2 - 6x + 8$

$y = (3)^2 - 6(3) + 8$

$y = 9 - 18 + 8$

$y = -9 + 8$

$y = -1$

MIN

2) $f(x) = -x^2 + 3x$

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

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

AOS

$x = \frac{3}{2}$ or 1.5

Vertex

(1.5, 2.25)

OR

$(\frac{3}{2}, \frac{9}{4})$

$f(x) = -x^2 + 3x$

$f(x) = -(\frac{3}{2})^2 + 3(\frac{3}{2})$

$f(x) = -\frac{9}{4} + \frac{9}{2}$

$f(x) = \frac{9}{4} = 2.25$

$= 2\frac{1}{4}$

Apr 14-8:56 AM