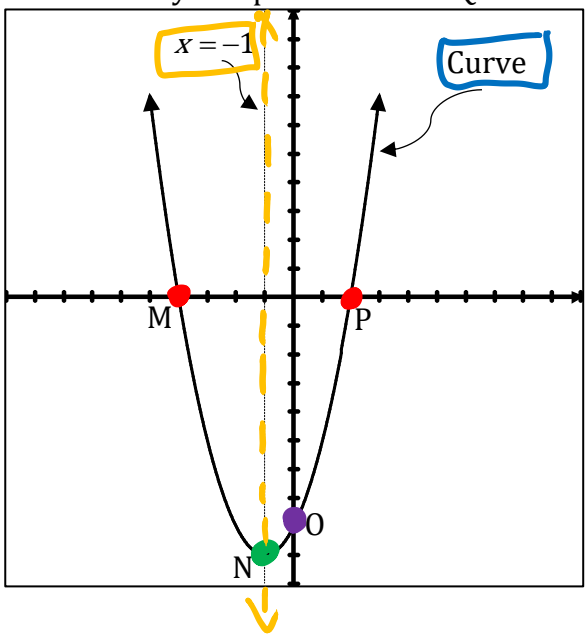
Unit 8 Day 5 Notes on Quadratics: Standard Form, End Behavior, Increasing and Decreasing KEY

Let's start with a vocab recap:

Name the key components of the Quadratic below:



Curve: parabola

M and P: x-intercepts
(to be dealt with later)

N: vertex (max or min)

O: y-intercept

$x=-1$: axis of symmetry

How do we find the y-intercept of a quadratic? Let $x=0$

Find the y-intercept of

a) $y=2x^2+12x+3$

$y=2(0)^2+12(0)+3$

$y=3$ $\boxed{(0,3)}$

b) $y=2(x-3)^2-2$

$y=2(0-3)^2-2$

$y=2(9)-2$

$y=16$ $\boxed{(0,16)}$

How do we find the vertex of a quadratic if it is not in Vertex Form?

$y=ax^2+bx+c$

For reason we will discuss later the formula is: $x=\frac{-b}{2a}$

What about the y-coordinate? = plug in the x-coordinate and solve for y

Find the Vertex of $y=2x^2+12x+3$.

a b c

$x=\frac{-12}{2(2)}=-3$

$y=2(-3)^2+12(-3)+3$

$y=18-36+3=-15$

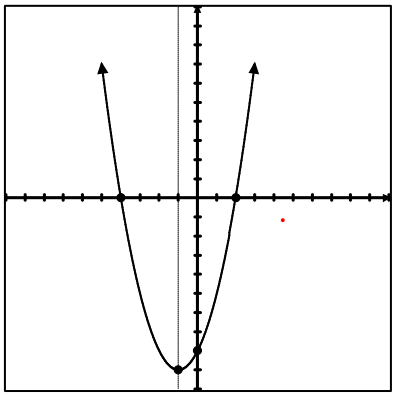
VERTEX: $(-3,-15)$

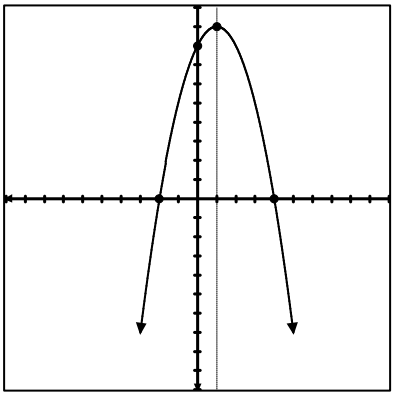
Find the Axis of Symmetry of $y=2x^2+12x+3$

VERTEX IS $(-3,-15)$ SO AXIS OF SYM. IS $x=-3$ (vertical line!)

In summary, if a quadratic is in **Standard form:**

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





Value of *a:*	positive ($a>0$)	negative ($a<0$)
Opens Up/Down:	UP	DOWN
Has Max/Min:	MIN	MAX
Equation of the Axis of Symmetry:	$x=\frac{-b}{2a}$	$x=\frac{-b}{2a}$
Vertex:	(,)	(,)
y-intercept:	$(0,c)$	$(0,c)$

SAME

End Behavior:

Describe the end behavior of $y = 2x^2 - 3x + 1$ → OPENS UP ↑↑

As $x \to \infty$, $y \to \infty$

As $x \to -\infty$, $y \to \infty$

Increasing vs Decreasing

What does increasing mean?

Going from left → right, y goes up

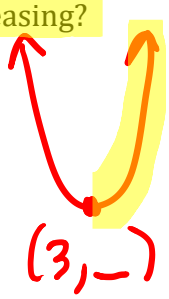
What does decreasing mean?

Going from left → right, y goes down

On what interval is $y = x^2 - 6x + 1$ increasing?

*Find the A.O.S!

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



Increasing $[3,\infty)$

We've graphed when the quadratic is in **vertex form**, but what if it is in **standard form**?

Graph using 5 points (vertex, y-int, symmetric pt, random, symmetric pt)

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

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

$y = 3^2 - 6(3) + 1$

$y = -8$

Vertex: (3, -8)

$y = 0^2 - 6(0) + 1$

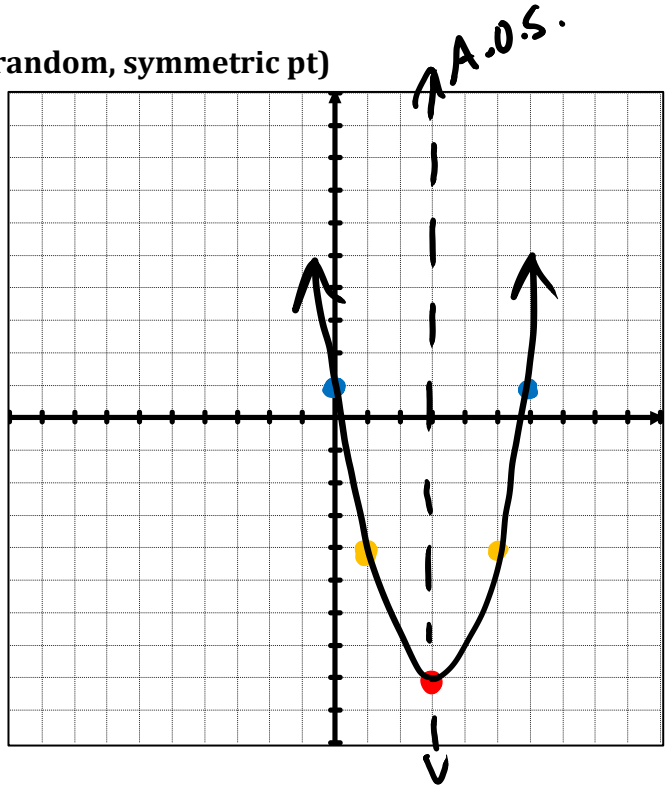
$y = 1$

y-intercept: (0, 1)

Pt Symmetric: (6, 1)

*Random pt: (1, -4) a=1, use the pattern

*Pt Symmetric: (5, -4)



You try:

Graph using 5 points

$y = x^2 + 4x - 1$

$x = \frac{-4}{2(1)} = -2$

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

$y = -5$

Vertex: (-2, -5)

$y = 0^2 + 4(0) - 1$

$y = -1$

y-intercept: (0, -1)

Pt Symmetric: (-4, -1)

Random pt: (-1, -4) pattern

Pt Symmetric: (-3, -4)