Name:

Algebra 1 Chapter 8 "Graphing Quadratics"

Standard form: $f(x) = ax^2 + bx + c$

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

"Freebie" Point: y-int. $(0, c)$

Work for other point(s):

Ex. $f(x) = 2x^2 + 8x - 1$

opens up $a = 2$ $b = 8$ $c = -1$

$x = \frac{-b}{2a} = \frac{-8}{2(2)} = \frac{-8}{4} = -2$

$x = -2$ AoS

$f(2) = 2(-2)^2 + 8(-2) - 1$

$= 2 \cdot 4 - 16 - 1 = 8 - 16 - 1 = -9$

Vertex $(-2, -9)$

y-int. $(0, -1)$

Additional point

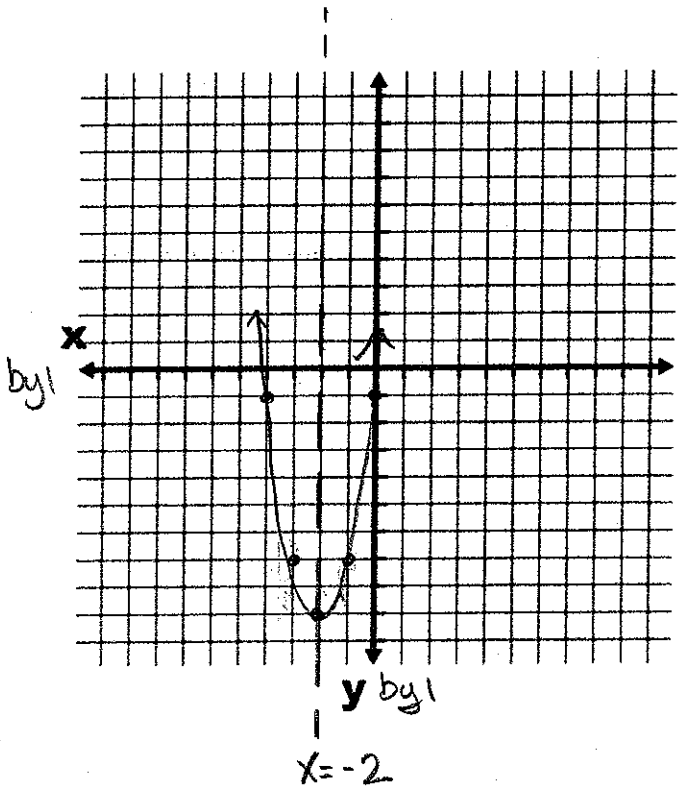
choose $x = -1$ because

-1 is between 0 and -2

$f(-1) = 2(-1)^2 + 8(-1) - 1$

$= 2 - 8 - 1 = -7$

$(-1, -7)$



Minimum value is -9

Steps to graphing. (for all forms)

1. Decide scale if necessary
2. Draw AoS + label
3. Find vertex (plug AoS in for x) & plot.
4. Plot additional points.
5. Draw curve with arrows.

D: $\mathbb{R}$

R: $\{y \geq -9\}$

Vertex form: $f(x) = a(x-h)^2 + k$

AoS: $x = h$

"Freebie" Point: Vertex (h, k)

Work for other point(s):

try $x = -1$

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

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

$= -2 + 3 = 1$

$(-1, 1)$

try $x = 0$

$g(0) = -2(0+2)^2 + 3$

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

$= -8 + 3 = -5$

$(0, -5)$

"Talk transformations"

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

if a is negative $\Rightarrow$ reflection over the x-axis

if $|a| > 1 \Rightarrow$ vertical stretch

if $|a| < 1 \Rightarrow$ vertical compression

if h is + (see minus) shift right

if h is − (see plus) shift left

if k is + (see plus) shift up

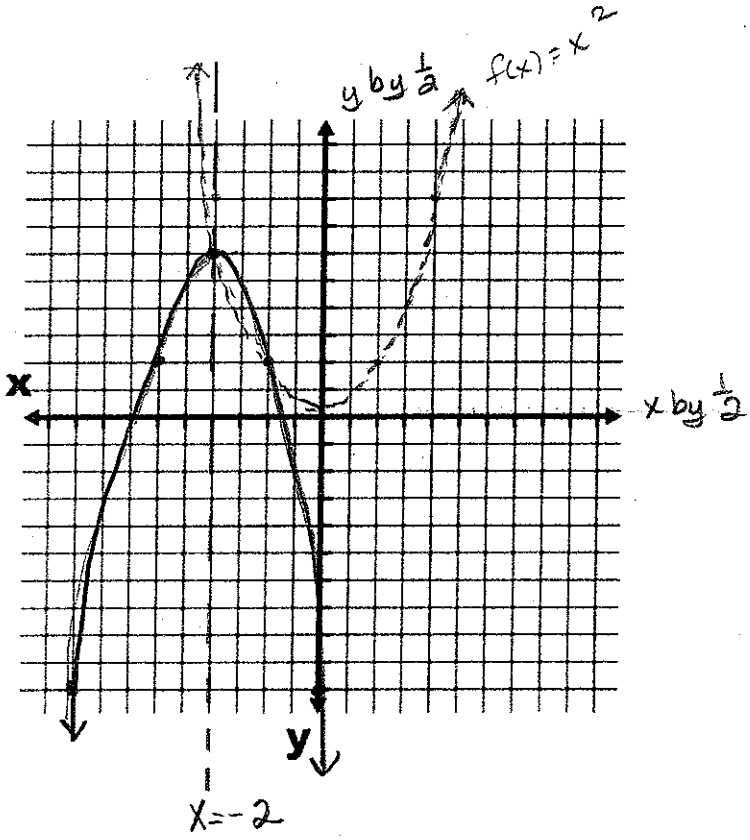
if k is − (see minus) shift down

Ex. $g(x) = -2(x+2)^2 + 3$

opens down $a = -2$ $h = -2$ $k = 3$

AoS $x = -2$

Vertex $(-2, 3)$



$g(x)$ is a reflection over the x-axis, a vertical stretch, a shift left 2 and a shift up 3 of $f(x)$.

Intercept form: $f(x) = a(x-p)(x-q)$

AoS: $x = \frac{p+q}{2}$

"Freebie" Point: x-intercept(s) $(p,0)$ $(q,0)$

Work for other point(s):

Ex. $f(x) = -(x+1)(x-5)$

opens down $a = -1$ $p = -1$ $q = 5$

$x = \frac{-1+5}{2} = \frac{4}{2} = 2$ → $x = 2$ AoS

$f(2) = -(2+1)(2-5)$

$= -(3)(-3)$

$= 9$

$(2,9)$ vertex

X-intercepts

$(-1,0)$ $(5,0)$

Additional point

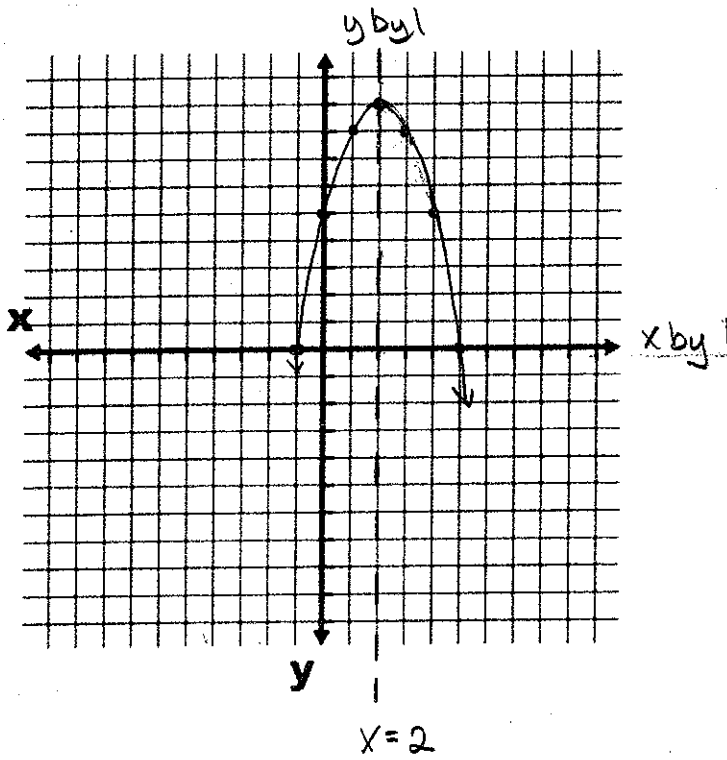
$x = 0$

$f(0) = -(0+1)(0-5)$

$= -(1)(-5)$

$= 5$

$(0,5)$



Zeros are

$x = -1$

$x = 5$

D: $\mathbb{R}$

R: $\{y \leq 9\}$

Maximum or Minimum? ↑ → minimum ↓ → maximum

Find the y-coordinate of the vertex

Ex. 1 $y = 3x^2 - 18x + 15$

Has minimum

$x = \frac{18}{2(3)} = \frac{18}{6} = 3$

$y = 3(3)^2 - 18(3) + 15$

$y = 27 - 54 + 15$

$y = -12$

The minimum value is -12

Ex. 2 $f(x) = -5x^2 + 10x + 7$

Has maximum

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

$f(1) = -5(1)^2 + 10(1) + 7$

$= -5 + 10 + 7$

$= 12$

The maximum value is 12.

Find Zeros: Set quadratic $= 0$, factor, set factors $= 0$ and solve

Ex. $g(x) = x^2 + 5x - 24$

$0 = x^2 + 5x - 24$

$0 = (x - 3)(x + 8)$

$x - 3 = 0 \qquad x + 8 = 0$

$x = 3 \qquad x = -8$

zeros

$a = 1 \qquad b = 5 \qquad c = -24$

$8 \cdot -3 = -24$

$8 + -3 = 5$

	x	8
x	x^2	8x
-3	-3x	-24

Determine Even and Odd? If even, $f(x) = f(-x)$. Graph symmetric about y-axis.

If odd, $f(-x) = -f(x)$

Ex. 1 $f(x) = 4x + 3$

Even? $f(x) = f(-x)$

$f(-x) = 4(-x) + 3$

$f(-x) = -4x + 3 \neq 4x + 3$ ($f(x)$)

Not even

Odd $f(-x) = -f(x)$

$-f(x) = -(4x + 3)$

$-f(x) = -4x - 3 \neq -4x + 3$ ($f(-x)$)

Not odd

Neither

Ex. 2 $g(x) = 3x^2$

Even? $g(x) = g(-x)$

$g(-x) = 3(-x)^2$

$g(-x) = 3x^2 = 3x^2$ ($g(x)$)

Even!

Odd? $g(-x) = -g(x)$

$-g(x) = -(3x^2)$

$-g(x) = -3x^2 \neq 3x^2$ ($g(-x)$)

Not odd