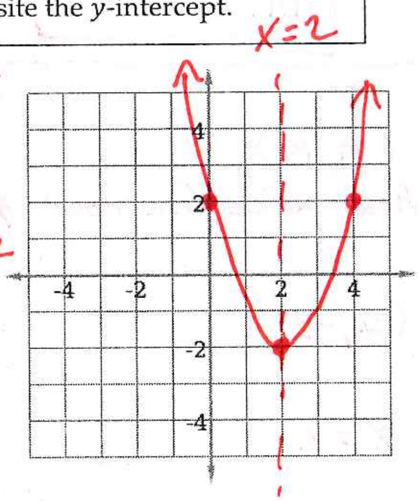
Notes 4-1 Graphing Quadratic Functions — Name ______________
Algebra II — Period ______

Standard Form for a Quadratic Function: $f(x) = ax^2 + bx + c$

quadratic term: ax^2 linear term: bx constant term: c

Graphing a Quadratic Function from Standard Form:
1. Rewrite in standard form if necessary and identify "a" , "b", & "c".
2. Find and plot the axis of symmetry: $x = -\frac{b}{2a}$
3. Find and plot the vertex: $\left(-\frac{b}{2a}, f\left(-\frac{b}{2a}\right)\right)$
4. Find and plot the y-intercept: $(0, c)$
5. Parabolas are symmetric: graph the point opposite the y-intercept.

Example #1: $f(x) = 2 - 4x + x^2$ $a=1$ $b=-4$ $c=2$



Rewrite in standard form: $\boxed{f(x) = x^2 - 4x + 2}$

Axis of symmetry: $x = -\frac{b}{2a}$ $x = -b/2a = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2$ $\boxed{x=2}$

Vertex: The x-coordinate is : $\boxed{2}$

The y-coordinate is f(2) = $\boxed{-2}$

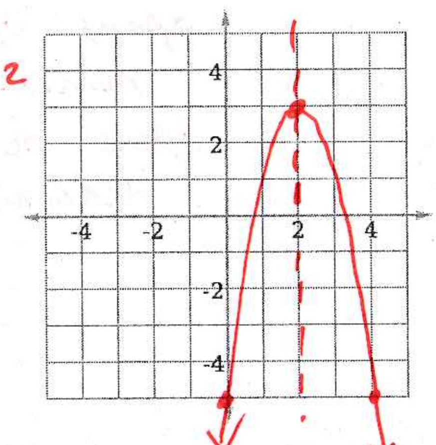
$2 - 4(2) + (2)^2 = 2 - 8 + 4 = -2$

y-intercept: $\boxed{(0,2)}$

point symmetric with the y-intercept: $\boxed{(4,2)}$

Domain: All Real #'s Range: $\boxed{[-2, \infty) \text{ or } \{y / y \geq -2\}}$

Example #2: Graph $f(x) = -2x^2 + 8x - 5$



Axis of symmetry: $\boxed{x=2}$ $x = -b/2a = \frac{-8}{2(-2)} = 2$

Vertex: The x-coordinate is: $\boxed{2}$ $\boxed{(2,3)}$

The y-coordinate is f(2) = $\boxed{3}$

$-2(2)^2 + 8(2) - 5 = -8 + 16 - 5 = 3$

y-intercept: $\boxed{(0,-5)}$

point symmetric with the y-intercept: $\boxed{(4,-5)}$

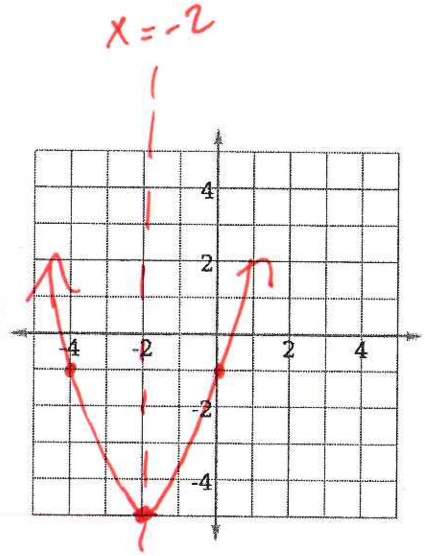
Domain: $\boxed{\text{All Real #'s}}$

Range: $\boxed{(-\infty, 3] \text{ or } \{y / y \leq 3\}}$

$a=1 \quad b=4 \quad c=-1$

Example #3: Graph $f(x) = x^2 + 4x - 1$

$x = -b/2a = -4/2(1) = -2$



Axis of symmetry: $\boxed{x=-2}$

Vertex: The x-coordinate is: $\boxed{-2}$ $\boxed{(-2,-5)}$

The y-coordinate is f(-2) : $\boxed{-5}$

$(-2)^2 + 4(-2) - 1 = \underline{-5}$

y-intercept: $\boxed{(0,-1)}$

point symmetric with the y-intercept: $\boxed{(-4,-1)}$

Domain: $\boxed{\text{All Real \#'s}}$ Range: $\boxed{[-5,\infty) \text{ or } \{y / y \geq -5\}}$

Ex #4 Vertex Form of a Quadratic Function: $f(x) = a(x-h)^2 + k$

Vertex: (h, k)

a = how wide/narrow & whether graph opens up$_{(a>0)}$ or down$_{(a<0)}$.

EX # 3: $f(x) = 2(x-2)^2 - 3$

Vertex: $(2,-3)$

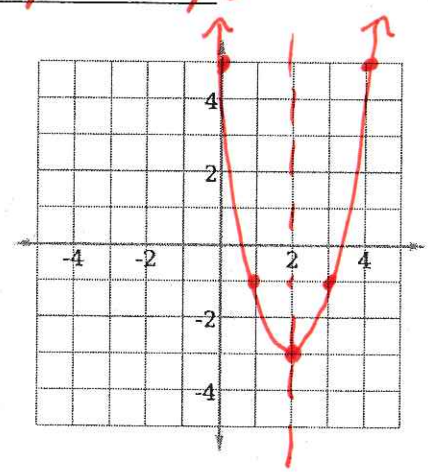
Axis of symmetry:

$x=2$

Domain:

Range:

2	-3
0	5
4	5
3	-1
1	-1



If a is positive, then opens up.

The vertex will be a minimum. We saw this in Example # 1 & 3.

If a is negative, then opens down.

The vertex will be a Maximum. We saw this in Example # 2.

The domain of a quadratic function will always be All Real #'s

The range of a quadratic function will depend on the vertex & whether it opens up or down.