Warm up

Simplify (no decimals)

1. $\frac{1}{2}\sqrt{32}\cdot\sqrt{2}$
2. $4\sqrt{\frac{16}{4}}$
3. $\sqrt{2}\cdot\sqrt{8}$

Solve for x.

4. $4(x^2 + 2) = 56$
5. $3x^2 - 27 = 0$

Warm up

Solve for x.

1. $4(x^2 + 2) = 56$

$4x^2 + 8 = 56$

$-8 \quad -8$

$\frac{4x^2}{4} = \frac{48}{4}$

$\sqrt{x^2} = \sqrt{12}$

$x = \pm\sqrt{4}\sqrt{3}$

$x = \pm 2\sqrt{3}$

2. $3x^2 - 27 = 0$

$+27 \quad +27$

$\frac{3x^2}{3} = \frac{27}{3}$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

Warm Up (Day 2)

Find the coordinates of the vertex.

$$y = x^2 + 6x + 5$$

$y = ax^2 + bx + c$

$a = 1, b = 6, c = 5$

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

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

$x = -3$

$y = (-3)^2 + 6(-3) + 5$

$= 9 - 18 + 5$

$y = -4$

vertex: $(-3, -4)$

Homework Questions?

Self Scoring Scale

4- I can *summarize* the concepts and explain it to others.

3- I can *apply* the concepts to answer questions correctly.

2- I can *apply* the concepts but with some *mistakes*.

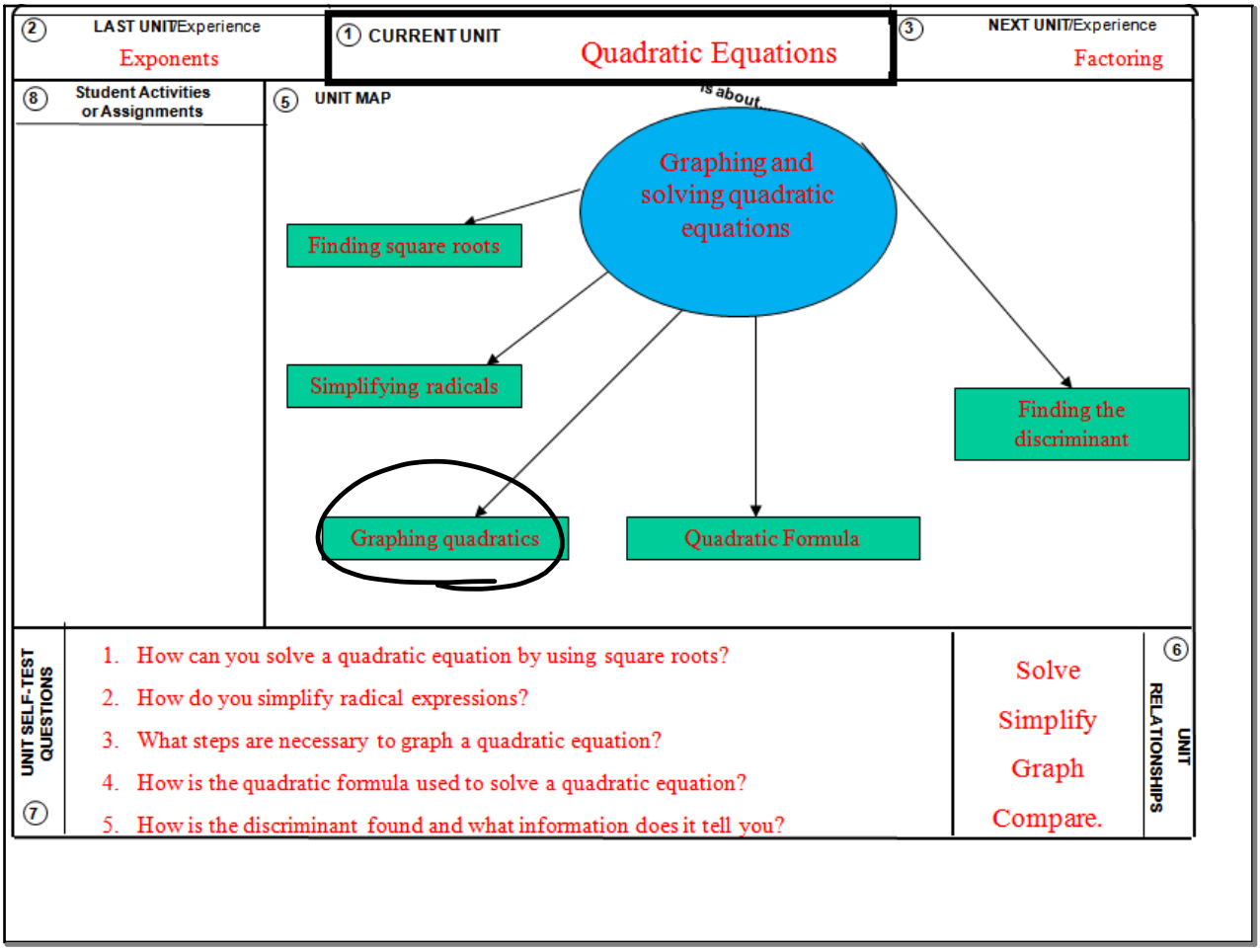
1- I *need help* to know how to apply the concepts.

0- I *can't* apply the concepts even with help.

9.4 Graphing Quadratic Functions

Goals:
- Sketch the graph of a quadratic function.

EQ: How do you find the vertex? How do you know if parabola opens up/down?



Vocabulary

Quadratic function:

Form $Ax^2+Bx+C=0$, $A\neq 0$

$y=ax^2+bx+c$

Numbers

$3x^2+2x+5=0$

$a=3, b=2, c=5$

Parabola: U shaped graph of a quadratic function

Vertex: $x = \frac{-b}{2a}$ (x, y) ← plug x back into original

Minimum (lowest point) (if opens up)

Maximum (highest point) (if opens down)

Axis of symmetry:

vertical line passing through the vertex

GRAPHING A QUADRATIC FUNCTION

The graph of $y = ax^2 + bx + c$, where $a \neq 0$, is a parabola.

Step 1 Find the x-coordinate of the vertex, which is $x = -\frac{b}{2a}$.

Step 2 Make a table of values, using x-values to the left and right of the vertex.

Step 3 Plot the points and connect them with a smooth curve to form a parabola

$a > 0$ (pos. #) up

$a < 0$ (neg. #) Down

Example 1: Quadratic Function with Positive a-Value

Sketch the graph of $y = x^2 - 4x + 4$.

a = 1, b = -4, c = 4 ; Opens? UP

Vertex: $x = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = \frac{4}{2}$

$x = 2$

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

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

$y = 4 - 8 + 4$

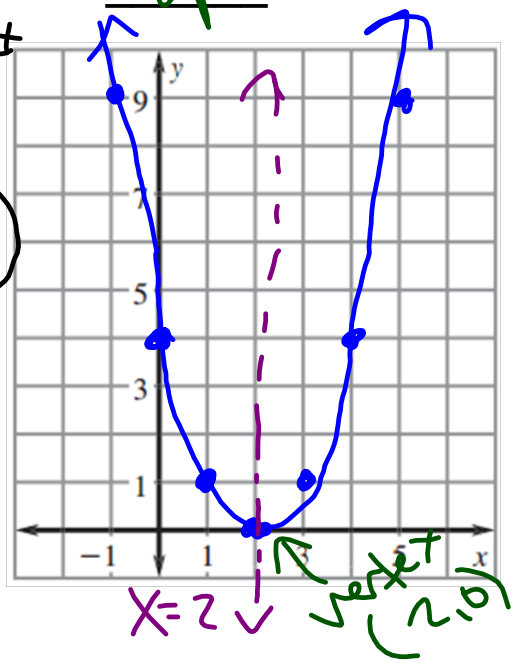
$y = 0$

(2, 0)

x	−1	0	1	2	3	4	5
y	9	4	1	0	1	4	9

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

Axis of symmetry: $x = 2$



Example 2: Quadratic Function with Negative a-Value

Sketch the graph of $y = -x^2 + 2x - 1$.

a = −1, b = 2, c = −1 ; Opens? Down

Vertex: $x = \frac{-b}{2a}$ $y = -(1)^2 + 2(1) - 1$

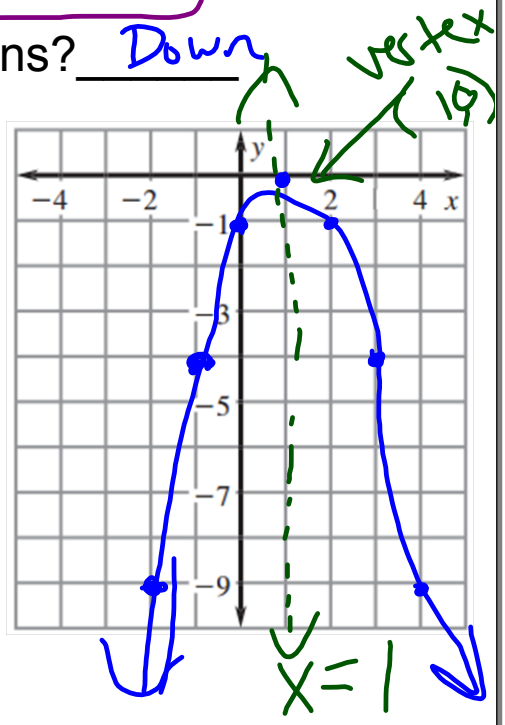
$x = \frac{-2}{2(-1)} = \frac{-2}{-2} = 1$ $= -1 + 2 - 1$

$y = 0$

$x = 1$ vertex (1, 0)

x	−2	−1	0	1	2	3	4
y	−9	−4	−1	0	−1	−4	−9

Axis of symmetry: $x = 1$



GRAPH OF A QUADRATIC FUNCTION

- The graph of $y = ax^2 + bx + c$ is a parabola.
- If a is positive ($a > 0$), the parabola opens up ∪
- If a is negative ($a < 0$), the parabola opens Down ∩
- The vertex has an x-coordinate of $x = \frac{-b}{2a}$
- The axis of symmetry is the vertical line $x = \frac{-b}{2a}$.
- The y-intercept is c.

Try It

Decide whether the parabola opens *up* or *down*.

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

$a = -1, b = -1, c = 1$

Down

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

$a = 3, b = -2, c = 2$

Up

$3x^2 + 1$

$a = 3, b = 0, c = 1$

$4x^2$

$a = 4, b = 0, c = 0$

Sketch the graph of the function.

3) $y = x^2 + 2x - 5$ $x = \frac{-b}{2a}$

$a=1, b=2, c=-5$

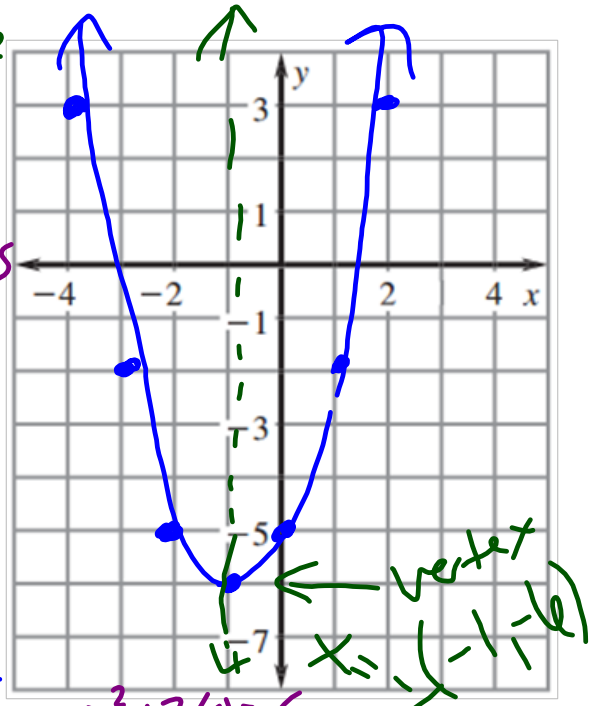
$x = \frac{-2}{2(1)} = \frac{-2}{2}$ $y = (-1)^2 + 2(-1) - 5$

$x = -1$ $= 1 - 2 - 5$

$y = -6$

vertex $(-1, -6)$

x	-4	-3	-2	-1	0	1	2
y	3	-2	-5	-6	-5	-2	3



Sketch the graph of the function.

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

$a=-4, b=4, c=-1$

$x = \frac{-b}{2a}$ $y = -4(\frac{1}{2})^2 + 4(\frac{1}{2}) - 1$

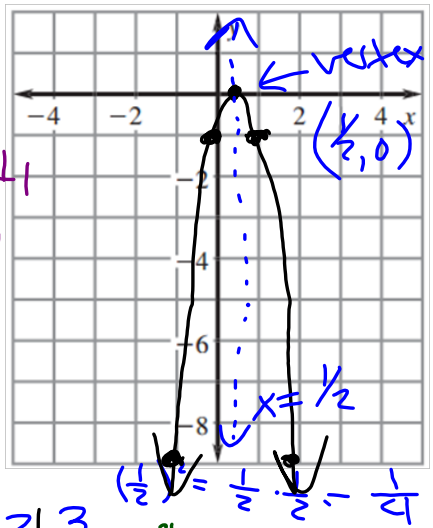
$x = \frac{-4}{2(-4)} = \frac{-4}{-8}$ $y = -4(\frac{1}{4}) + 2 - 1$

$y = -1 + 2 - 1$

$x = \frac{1}{2}$ $y = 0$

vertex: $(\frac{1}{2}, 0)$

x	-2	-1	0	½	1	2	3
y	-25	-9	-1	0	-1	-9	-25



$(\frac{1}{2})^2 = \frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

$\pm\frac{3}{2}$

X	Y

Summary

EQ: How do you find the vertex? How do you know if parabola opens up/down?

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

y → plug in to original

$a > 0$ (pos) Up

$a < 0$ (neg) Down

9.4 Homework

9.3 Practice A wkst

#1-23, 33, 34*

22 + 23 ∨