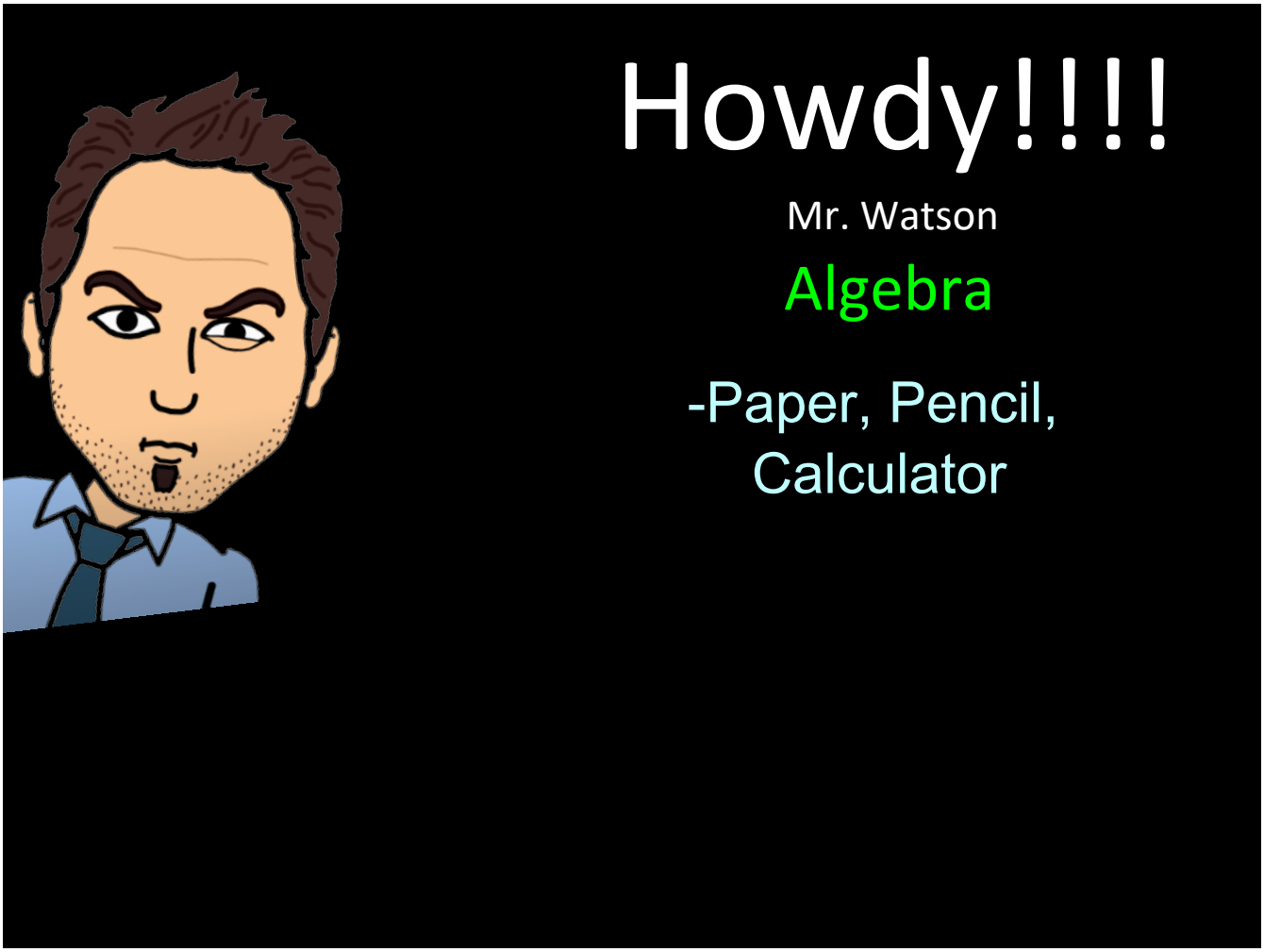

Howdy!!!!
Mr. Watson
Algebra
-Paper, Pencil,
Calculator

Transformations and Vertex

$y = -3(x+14)^2 - 18$

Reflect Stretch 3
left 14 down 18
(-14, -18)

$y = -\frac{1}{4}x^2 + 2$

Reflect shrink $\frac{1}{4}$
up 2
(0, 2)

Write the equations of a quadratic that has a vertex at (4, -2) that also stretches 3:

$y = 3(x-4)^2 - 2$

When is the graph...

Vertex: (3, 1) Axis of Symmetry: $x = 3$

Interval of Increase: $x < 3$

Interval of Decrease: $x > 3$

Extrema: max Max/Min Value: $y = 1$

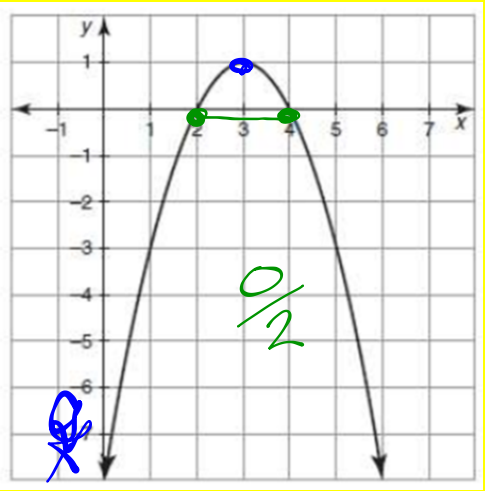
Domain: $\mathbb{R}$ Range: $y \leq 1$

Y-Intercept: (0, -8) Zeroes: $x = 2$ $x = 4$

End Behavior: As $x \to -\infty$, $f(x) \to -\infty$

As $x \to \infty$, $f(x) \to -\infty$

Rate of change on the interval $2 \leq x \leq 4$: 0



Convert the following

Vertex to Standard

$y = -3(x+1)^2 + 4$

	x	1
x	x^2	$1x$
1	$1x$	1

$-3(x^2+2x+1)+4$

$-3x^2-6x-3+4$

$-3x^2-6x+1$

Standard to Vertex

$y = 2x^2 + 8x - 9$

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

$y = -17$

$y = 2(x+2)^2 - 17$

Algebra Unit 6: Graphing Quadratic Functions Notes

Converting from Vertex to Standard Form

Steps: 1. Make a box to multiply for what is in parenthesis
2. Multiply the a
3. Add/Subtract the constant

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

2. $y = -3(x+2)^2 + 5$

3. $y = -(x-1)^2 - 1$

4. $y = 5(x+7)^2 - 12$

Converting from Standard to Vertex Form

Steps: 1. $x = \frac{-b}{2a}$
2. Substitute x into equation to get y
3 Write it in vertex form: $a(x-h)^2 + k$

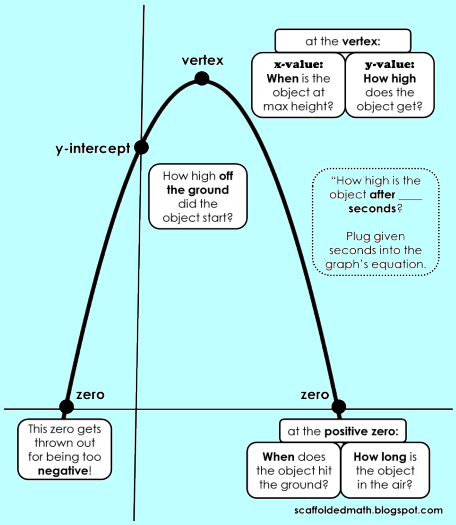
1. $y = 2x^2 - 4x + 6$

2. $y = 3x^2 - 12x + 5$

3. $y = -x^2 - 2x - 1$

4. $y = 5x^2 - 12$

Quadratic Keywords



Applications of the Vertex

Words that Indicate Finding Vertex of a Quadratic	Quadratics (so far)
• Minimum/Maximum • Minimize/Maximize • Least/Greatest • Smallest/Largest	Standard Form: $y = ax^2 + bx + c$, y-int: (0, c) Vertex Form: $y = a(x - h)^2 + k$, vertex: (-h, k) Vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

Standard Form:

1. A baker has modeled the monthly operating costs for making wedding cakes by the function $y = 0.5x^2 - 12x + 150$, where y is the total costs in dollars and x is the number of cakes prepared.

Standard form:

a. How many cakes should be prepared each month to yield the minimum operating cost?

$x = \frac{-b}{2a} = \frac{12}{2(.5)} = \frac{12}{1} = 12$

$y = 78$

12 cakes

b. What is the minimum monthly operating cost?

$78

2. The arch of a bridge forms a parabola modeled by the function $y = -0.2(x - 40)^2 + 25$, where x is the horizontal distance (in feet) from the arch's left end and y is the corresponding vertical distance (in feet) from the base of the arch. How tall is the arch?

Vertex form

Vertex: (40, 25)
x y

25 ft

3. Suppose the flight of a launched bottle rocket can be modeled by the equation $y = -x^2 + 6x$, where y measures the rocket's height above the ground in meters and x represents the rocket's horizontal distance in meters from the launching spot at x = 0. How far has the bottle rocket traveled horizontally when it reaches it maximum height? What is the maximum height the bottle rocket reaches?

Stand

x axis

y value

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

$y = 9$

Horizontally: 3m

Height: 9m

b. How far does the bottle rocket travel in the horizontal direction from launch to landing?

6 m start to finish

(calculator graph)

Algebra 1 Graphing Quadratics Practice

6. The valley between ~~two mountains whose peaks~~ touch the x-axis is $y = 40.4x^2 - 404x$, where x and y are measured in feet. How deep is the valley?

Standard

$x = \frac{-b}{2a} = \frac{404}{2(40.4)} = \frac{404}{80.8} = 5$

$y = -1010$

-1010 ft

7. A football is kicked into the air. Its height, in meters, after t seconds is given by $h = -4.9(t - 2.4)^2 + 29$.

a. What is the maximum height of the ball?

Vertex: $(2.4, 29)$

29 ft

b. How high was the ball after 2 seconds?

Calculator: $(2, 28.2)$

28.2 ft

c. Was the ball still in the air after 5 seconds?

$(5, -4.1)$

No, negative answer

8. The ~~equation for the motion of a projectile fired straight up at an initial velocity of 64 feet per second is $-16t^2 + 64t = h$, where h is the height in feet and t is the time in seconds. Find the time the projectile needs to reach its highest point. How high will it go and how long will it take?~~

$x = \frac{-b}{2a} = \frac{-64}{2(-16)} = \frac{-64}{-32} = 2$

$y = 64$

How Long: 2 sec

Height: 64 ft

9. A model for a company's revenue is $R = -15p^2 + 300p + 12{,}000$, where p is the price in dollars of the company's product. What price will maximize revenue? What will be the maximum revenue?

10. The profit from selling local ballet tickets depends on the ticket price. Using past receipts, we find that the profit can be modeled by the function $p = -15x^2 + 600x + 60$, where x is the price of each ticket. What is the ticket price that gives the maximum profit?

Algebra 1 Graphing Quadratics Practice

6. The photo shows the Verranzo-Narrows Bridge in New York, which has the longest span of any suspension bridge in the United States. A suspension of cable of the bridge forms a curve that resembles a parabola. The curve can be modeled with the function $y = 0.0001432(x - 2130)^2$, where x and y are measured in feet. The origin of the function's graph is at the base of one of the two towers that support the cable.

Vertex: (2130, 0)

a. How far apart are the towers?

2130 + 2130 = 4260 ft apart

b. How tall are the towers?

A frog is about to hop from the bank of a creek. The path of the jump can be modeled by the equation $h(x) = -x^2 + 4x + 1$, where h(x) is the frog's height above the water and x is the number of seconds since the frog jumped. A fly is cruising at a height of 5 feet above the water.

3. Is the extrema a maximum or minimum? Why?

max, reflected top

2. What is the vertex?

(2, 5)

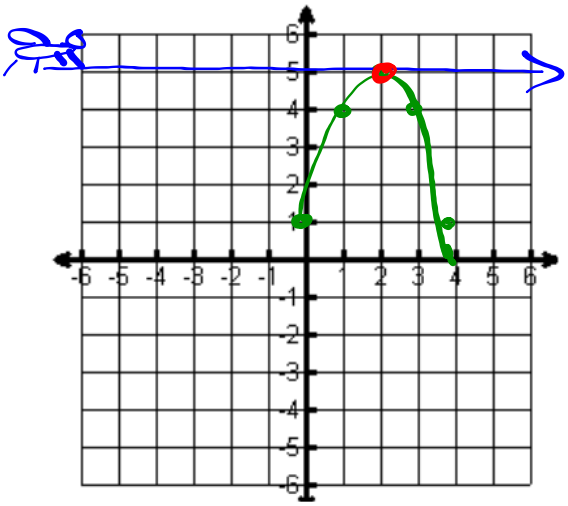
4. If the frog jumps to catch the fly, it is possible for the frog to catch the fly?

Yes at 2, 5

1. Graph the paths of the frog and fly.

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

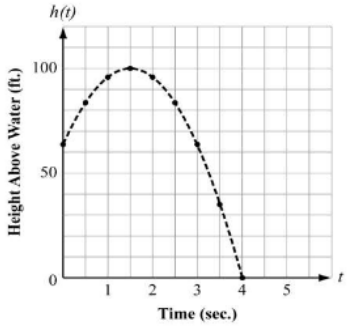
x	y
0	1
1	4
2	5
3	4
4	1



Name: _____ Date: _____

Quadratics Modeled in the Real World

Philip is standing on a rock ledge 64 feet above a lake, and he tosses a rock with a velocity of 48 feet per second. This graph and table represent the height above the water, $h(t)$, as a function of time, t, in seconds after Philip releases the rock.



Time t	Height $h(t)$
0	64
1	96
2	96
3	64
4	0

1. What is the maximum height of the rock?

2. After how many seconds does the rock change direction in the air?

3. When does the rock hit the surface of the lake?

   What is this point on the graph called?

   How can you identify this from the table?

4. Identify the vertex and the axis of symmetry.

   What do these represent in our story?

5. At 1 sec, what direction is the rock moving?

   At 2 sec, what direction is the rock moving?

Pass Back Quiz