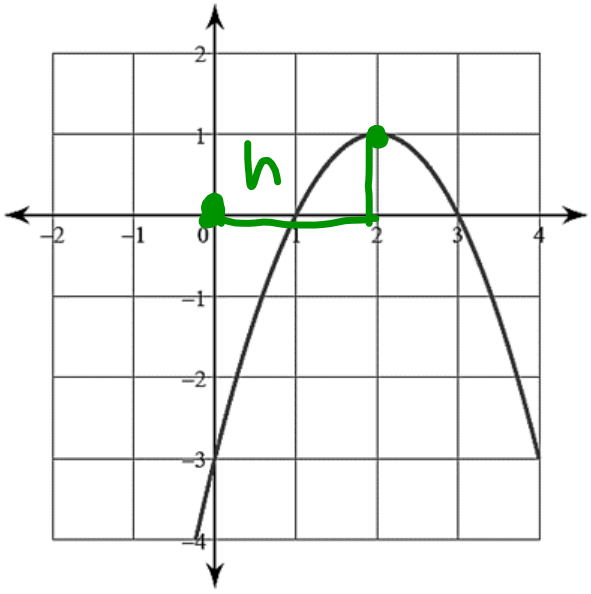
Warm-Up (EOC Type) 3/29/2021

1.



$h = -2$

$k = 1$

$a = -ve$

Write the equation of this graph in

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

b. Standard Form : $y = ax^2 + bx + c$

1a) Vertex Form

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

b) Convert from Vertex to Standard form.

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

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

	x	-2
x	x^2	$-2x$
-2	$-2x$	4

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

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

$y = -x^2 + 4x - 3$

2. Name the form and characteristics you see just from looking at the equation:

a. $y = (x - 5)(x + 2)$

factored form
or
Intercept Form

X-intercepts: $x = 5$ and $x = -2$

$a = +v$

b. $y = x^2 + 5x - 10$

Standard Form

y-intercept: $(0, -10)$

$a = +v$

c. $y = -(x + 4)^2 + 6$

h k

Vertex Form

Vertex = (h, k)

$V = (-4, 6)$

d. $y = x^2 - 7$

Standard form

y-intercept: $(0, -7)$

Vertex form

Vertex = $(0, -7)$

3. Find the vertex by completing the square:

a. $y = x^2 + 4x + 5$

b. $y = \frac{2x^2 + 8x - 12}{2}$

$y = (x^2 + \frac{4}{2}x) - 6$ $\quad \frac{4}{2} = 2^2 = 4$ $+/-$

$y = (x^2 + \frac{4}{2}x + 4) - 6 - 4$

$y = (x+2)^2 - 10$

$h \quad k$

Vertex $= (-2, -10)$

3a) $y = (x^2 + 4x) + 5$

$\frac{4}{2} = 2^2 = 4$ +/-

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

Perfect square trinomial

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

h k

Vertex $= (-2, 1)$

4. Consider the function $f(x) = x^2$. The graph of $f(x)$ is reflected over the x-axis, shifted 5 units to the right, and 2 units down to produce $g(x)$. What is the equation of $g(x)$?

A. $g(x) = -(x - 5)^2 - 2$

B. $g(x) = (x - 5)^2 - 2$

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

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

5. If the vertex of a parabola is (1, 2) and the graph opens down, which of the following could represent this function?

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

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

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

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

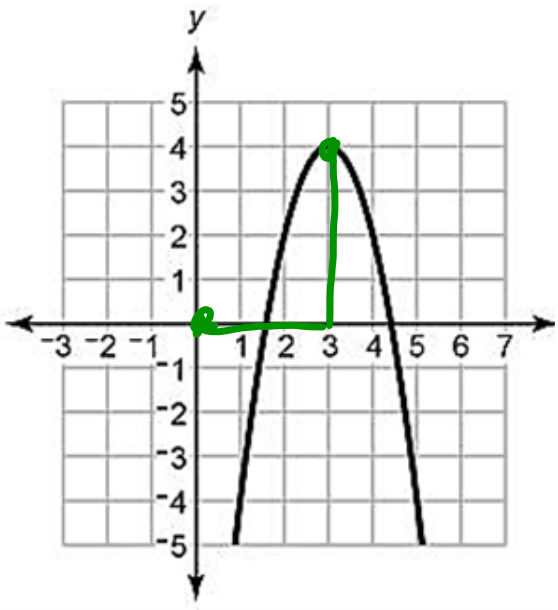
6. Using the parent function $f(x) = x^2$, which equation models the transformations of the graph?

A. $f(x) = -2(x - 3)^2 + 4$

B. $f(x) = 2(x - 3)^2 + 4$

C. $f(x) = -2(x + 3)^2 + 4$

D. $f(x) = 2(x + 3)^2 + 4$



7. Which quadratic equation stretches the parent function by a factor of 8 and shifts the function left 4 units?

A. $\frac{1}{8}(x+4)^2$

B. $y = 8(x - 4)^2$

C. $y = 8(x + 4)^2$

D. $y = 8x^2 - 4$

8. Compared to the graph of $f(x) = x^2$, the graph of $g(x) = 2x^2 - 5$ is _____.

A. narrower and translated down

B. narrower and translated up

C. wider and translated down

D. wider and translated up

Essential Question 3/29/2021

How can I use the vertex and other characteristics of a quadratic function to model real life situations?

Learning Target

Applying vertex to real life situations.

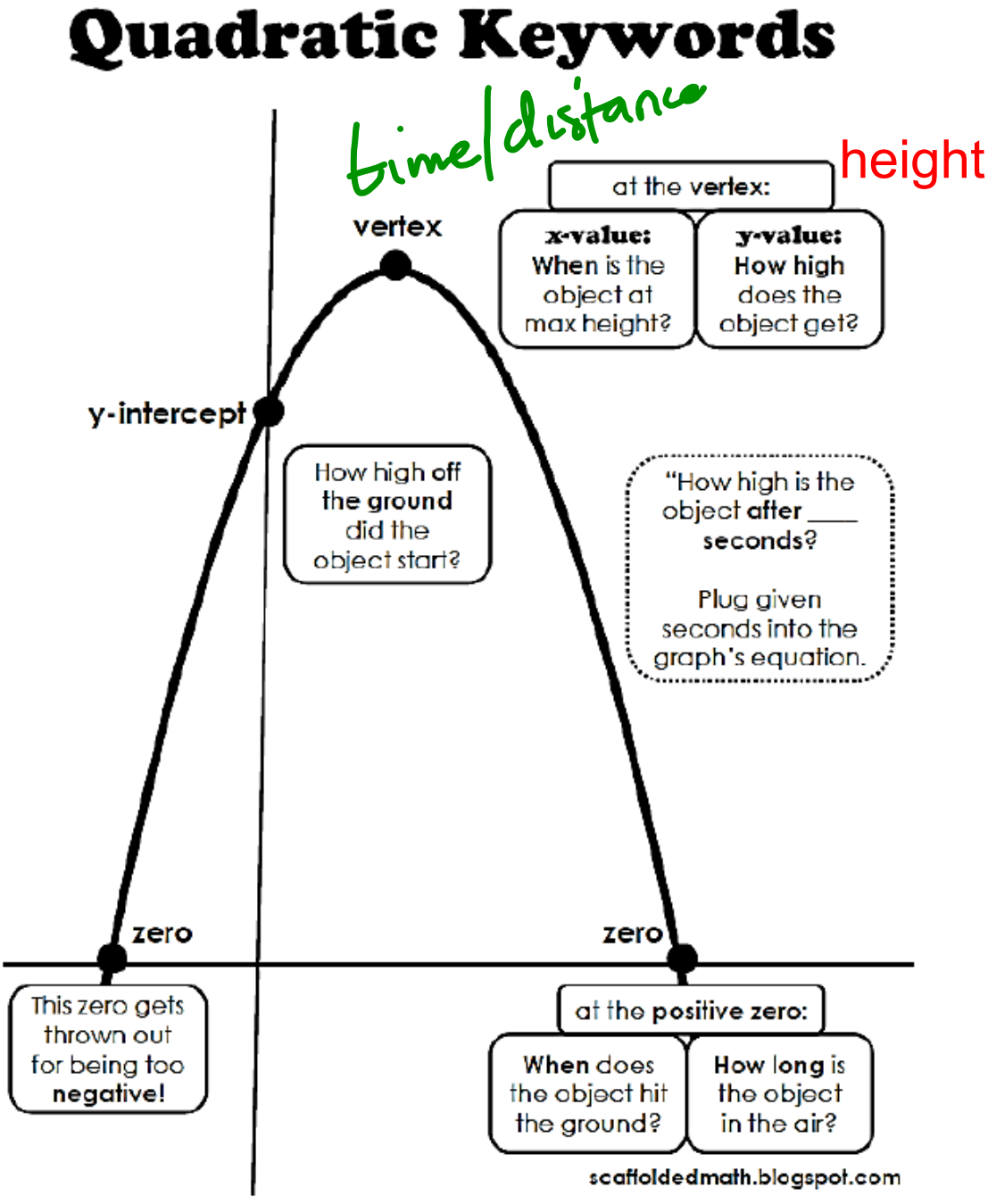
Applications of the Vertex

Standard(s): MGSE9-12.F.IF.4 Using tables, graphs, and verbal descriptions, interpret the key characteristics of a function which models the relationship between two quantities.

Note these!!!

Words that Indicate Finding Vertex	Quadratic Equations	
• 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)
	Factored Form: $y = a(x - p)(x - q)$	x-int: (p, 0) & (q, 0)

Word problems involve solving either for h or k of the vertex using $x = \frac{-b}{2a}$


Quadratic Keywords
time/distance
height
vertex
at the vertex:
x-value: When is the object at max height?
y-value: How high does the object get?
y-intercept
How high off the ground did the object start?
"How high is the object after ____ seconds?
Plug given seconds into the graph's equation.
zero
zero
This zero gets thrown out for being too negative!
at the positive zero:
When does the object hit the ground?
How long is the object in the air?
scaffoldedmath.blogspot.com

Scenario 1 - I do

Scenario 1. 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?

height → k or x-value of Vertex

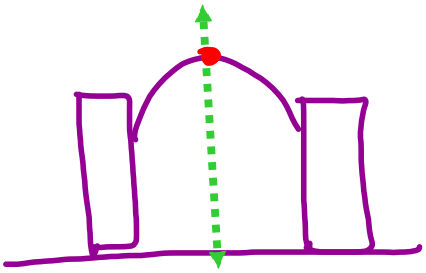
given: $y = -0.2(x-40)^2 + 25$

Vertex form

$(h, k) = (40, 25)$

Therefore, the arch is 25 ft tall.

No calculations needed here!



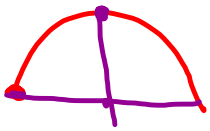
Scenario 2 - We do

Scenario 2. 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.

a. How far has the bottle rocket traveled horizontally when it reaches it maximum height? What is the maximum height the bottle rocket reaches?

$y = -x^2 + 6x$

$a = -1 \quad b = 6$



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

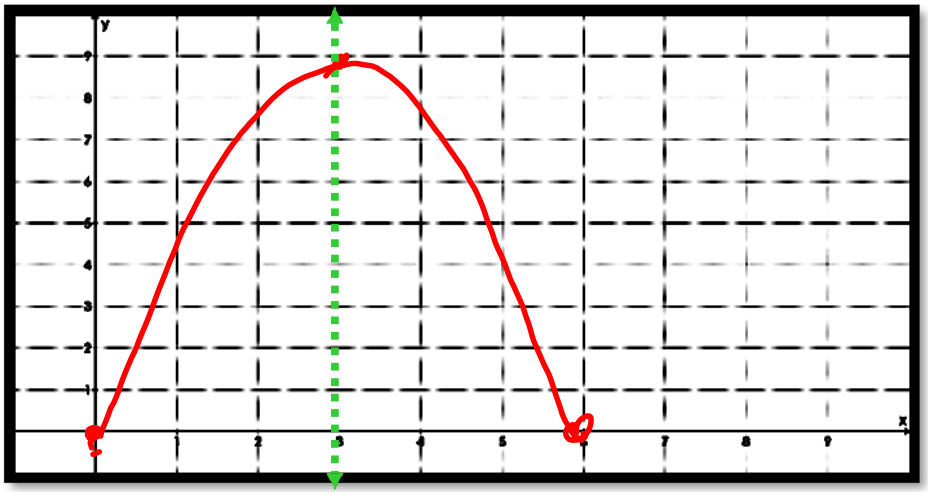
The bottle rocket travels 3 meters horizontally to reach its maximum height.

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

$y = -9 + 18$

$y = 9 \quad \text{Vertex}(3, 9)$

The rocket reaches a maximum height of 9 meters.



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

b) $-x^2+6x=0$

$-x(x-6)=0$

$-x=0$

$x=0$

$x=6$ meters

We cannot have a zero distance.

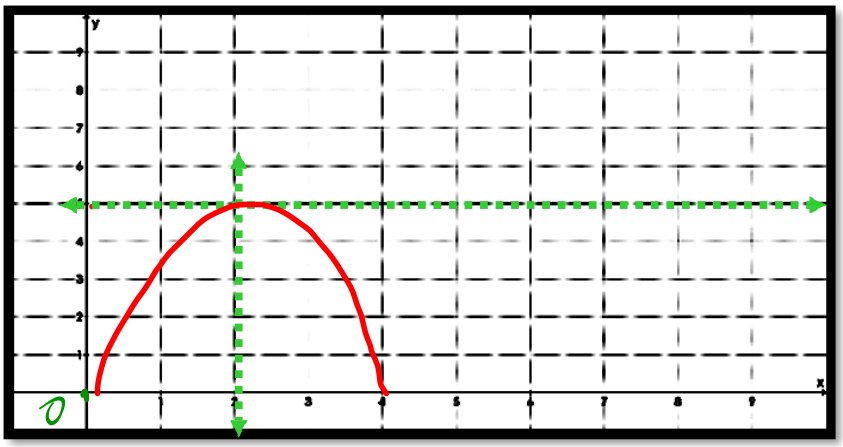
The bottle rocket travelled 6 meters from launch to landing.

Scenario 3 - You do

Scenario 3. 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. Is it possible for the frog to catch the fly, given the equation of the frog's jump?

y-value of vertex = height of frog.

y
height



$h(x) = -x^2 + 4x + 1$ x-Seconds

$a = -1 \quad b = 4$

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

It takes 2 seconds for the frog to reach its maximum height.

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

$y = 5 \quad (h, k) = (2, 5)$

It is possible for the frog to catch the fly because its jump is 5 ft above the water.

Scenario 4 - You do

Scenario 4. A model rocket is launched straight upward. The path of the rocket is modeled by $h = -16t^2 + 200t$, where h represents the height of the rocket and t represents the time in seconds.

a. What is its maximum height? y-value

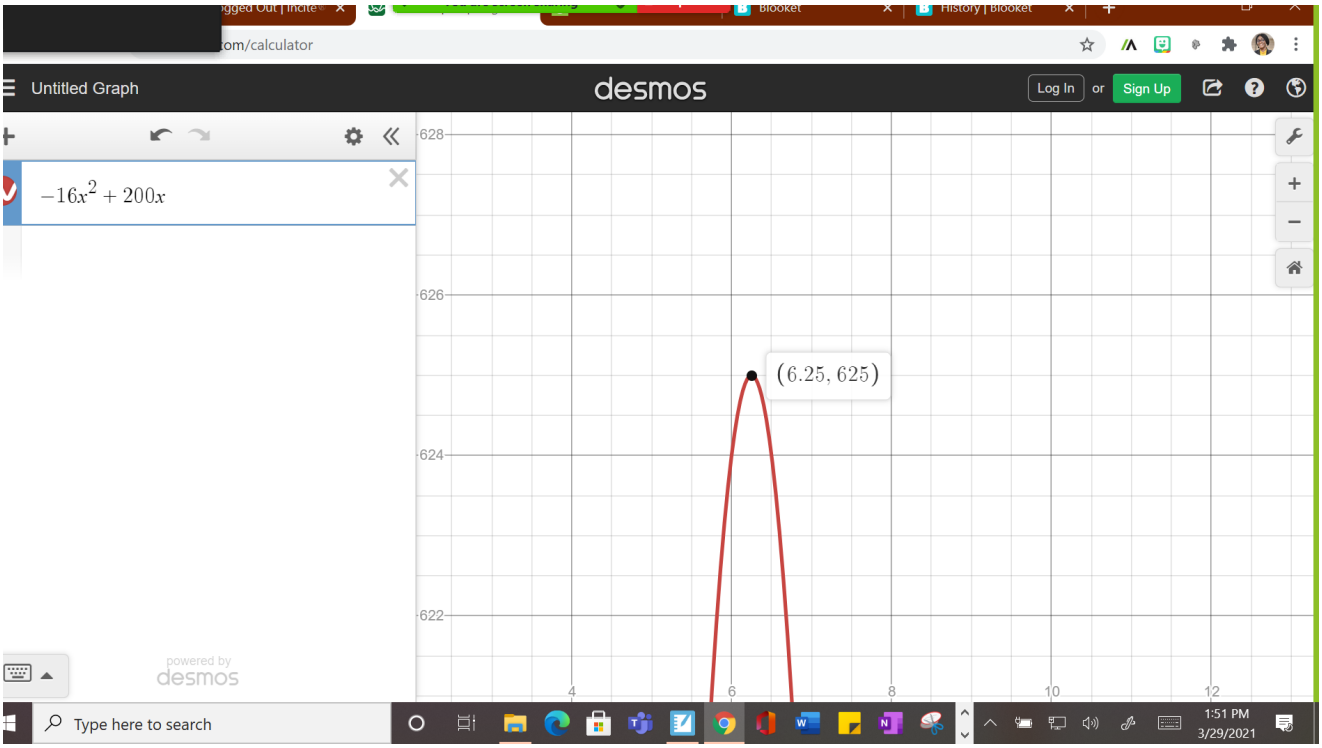
625 ft

b. Is it still in the air after 8 seconds? Explain why or why not.

$h(8) = -16(8)^2 + 200(8)$

$h(8) = 576$ ft

Yes, the model rocket is still in the air after 8 seconds. The height of the model rocket is 576 ft after 8 seconds.


Untitled Graph
desmos
Log In
or
Sign Up
$-16x^2 + 200x$
628
626
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622
(6.25, 625)
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