5. Two seagulls dive into the ocean. The given functions represent the height of each seagull above the surface of the ocean as a function of the seagull's horizontal distance from a center buoy. For each set of functions, **determine which bird descends deeper into the ocean**. Support your answer with facts (work).

a.

First Seagull: $f(x) = 3(x-2)^2 - 5$

Second Seagull: $g(x) = \{(-8,0),(-6,-4),(-4,0)\}$

vertex

$3(x-2)(x-2)-5$
$3(x^2-4x+4)-5$
$3x^2-12x+12-5$
$3x^2-12x+7$

$x = \frac{12}{3(2)} \to 2$

$3(2-2)^2-5 \to -5$

$V: (2,-5)$

$\boxed{\text{goes deeper in ocean}}$

b.

First Seagull: $f(x) = 3x^2 - 12x + 7$ $\to \frac{12}{2(3)} \to 2$ $3(2)^2-12(2)+7 \to -5$

$V: (2,-5)$

Second Seagull: $g(x) = \frac{1}{2}(x+2)^2 - 6$

$(-2,-6) \leftarrow \boxed{\text{deeper in ocean}}$

c.

First Seagull: $f(x) = 2x^2 - 8x + 11$ $\to \frac{8}{2(2)} \to 2$ $2(2)^2-8(2)+11 \to 3$

$V: (2,3)$

Second Seagull:

x	-3	-1	1	3	5
g(x)	11	6	3	2	3

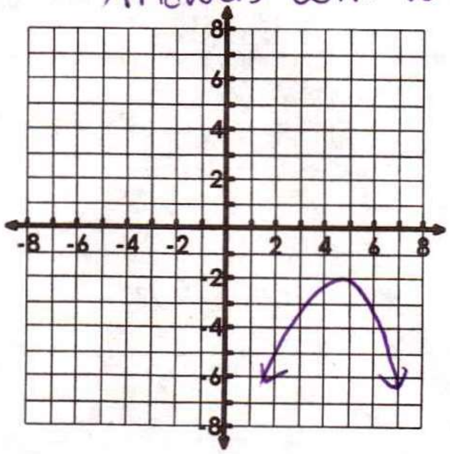
vertex

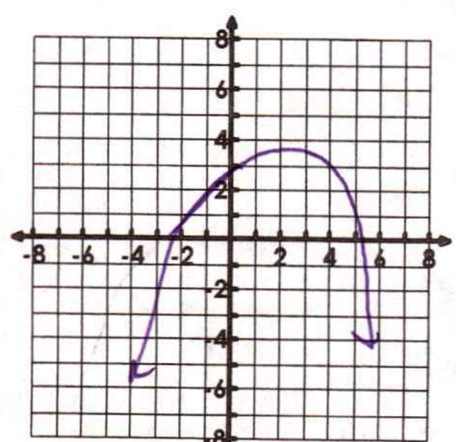
$\boxed{\text{deeper in ocean}}$

6. Which function has the lesser maximum value? Why? 1st Seagull $2 < 3$

A. Parabola with no x-intercepts and a < 0? **OR** B. Parabola with two x-intercepts and a < 0?

Answers will vary





Use the graphs to help explain your answer.

Graph A is all in the negative region.
Graph B has a vertex in the positive region, thus crossing the x-axis twice

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Day 11 – Applications of the Vertex
Practice Assignment

Name: ____________________
Date: ____________ **Block:** ______

Review – Find the vertex of the following equation: $y = 2x^2 - 4x + 5$.

$a=2$
$b=-4$
$c=5$

$x = \frac{4}{2(2)} \to 1$ $\quad 2(1)^2 - 4(1) + 5 \to 3$

$\boxed{V: (1, 3)}$

Directions: Answer the following questions that pertain to using applications of the vertex.

1. 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?

y-value *vertex*

$a = 40.4$
$b = -404$

$x = \frac{404}{2(40.4)} \to 5$ $\quad 40.4(5)^2 - 404(5) \to -1010$

$V: (5, -1010) \to \boxed{\text{1010 ft. deep}}$

2. 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 of vertex

$a = -16$
$b = 200$
$c = 0$

$x = \frac{-200}{2(-16)} \to 6.25$ $\quad y = -16(6.25)^2 + 200(6.25) \to 625$

$V: (6.25, 625)$

$\boxed{\text{625 feet high}}$

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

plug 8 in, if it's pos # it is still in the air

$-16(8)^2 + 200(8) \to 576$

$(8, 576)$

$\boxed{\text{After 8 sec, it is still 576 feet high}}$

c. Is it still in the air after 14 seconds? Explain why or why not.

$-16(14)^2 + 200(14) \to -336$

$\boxed{\text{it will not be in the air after 14 sec.}}$

V: (P, R)

3. 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?

$a = -15$
$b = 300$
$c = 12{,}000$

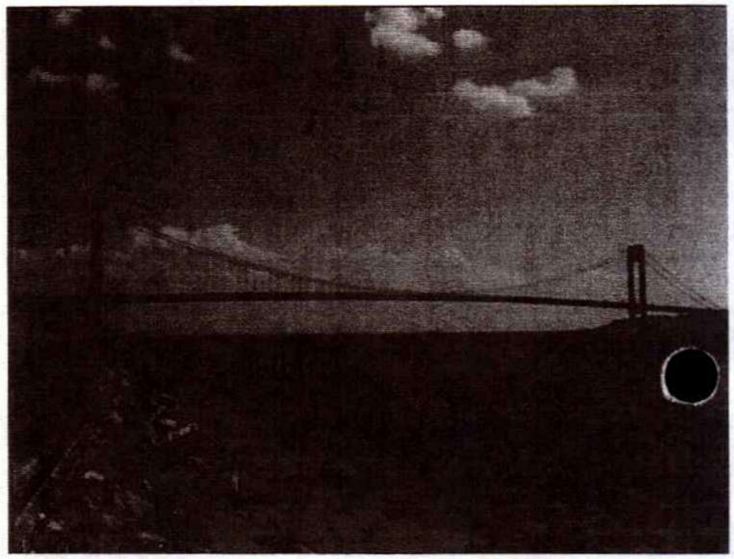
$x = \frac{-300}{2(-15)} \to 10$

$-15(10)^2 + 300(10) + 12000 \to 13{,}500$

Price V: (10, 13,500) Revenue

$10 per product will maximize revenue of $13,500

4. 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 $\mathbf{y = 0.0001432(x - 2130)^2}$, 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.



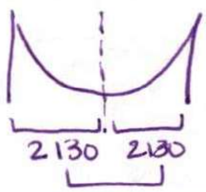
a. What is the vertex of the bridge between two towers?

$y = .0001432(x - 2130)^2$
a h k

V: (h, k)

V: (2130, 0)

b. How far apart are the towers?



4260 ft

5. A sports store sells about 50 mountain bikes per month at a price of $220 each. For each $20 decrease in price, about 10 more bikes per month are sold. Complete the table below

Price	Bikes	Revenue
220	50	11,000
200	60	12,000
180	70	12,600
160	80	12,800
140	90	12,600
120	100	12,000
100	110	11,000

← Vertex

* look for vertex

a. How many prices changes does it take to make a maximum amount of revenue?

3 changes

b. At what price and how many bikes need to be sold to maximize their revenue?

(P, R) (160, 12800)

$160

(B, R)
(80, 12800)

80 bikes to max