MFM 2P Mrs. Roen Name: _____

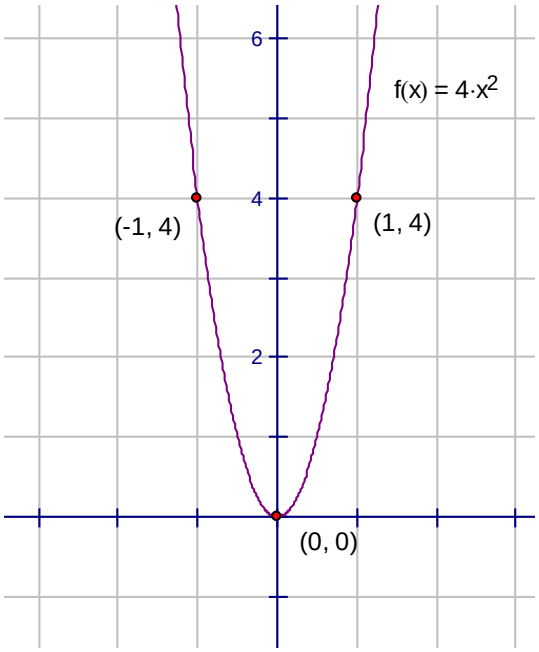
Course: MFM2P Gr. 10 Applied **Lesson: 7 - 4**

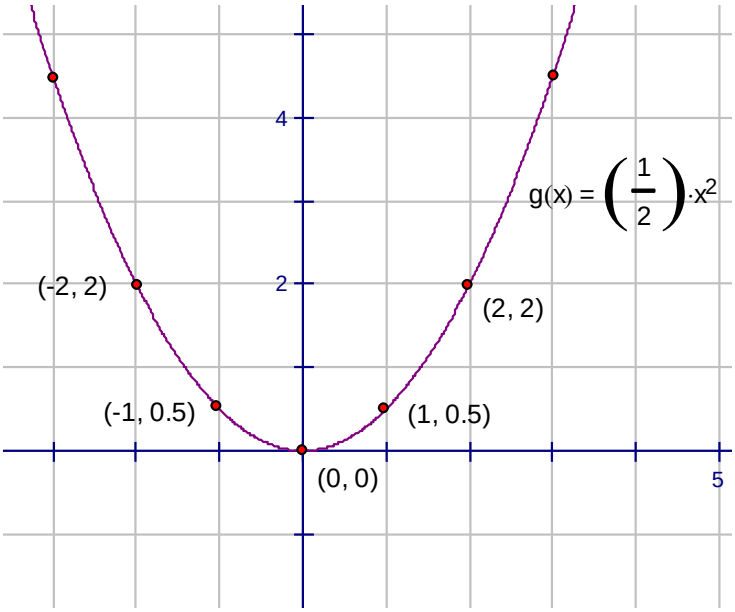
Unit: Representing Quadratic Relations **Topic: Interpreting a and c in Quadratics**

- ***homework check:*** **Lesson 7 - 3**

- ***note:*** **Interpreting a and c in Quadratic Relations**

By investigating quadratics of the form $y = ax^2 + c$, we can find how the value of ***a*** affects how wide or narrow the parabola is on the graph. For example, look at the given parabolas.





Which of these parabolas is wider?

Second one on right

What is the value of ***a*** in each?

One on left a = 4 ***One on right a = one half***

What is the connection between the value of ***a*** and how wide or narrow the parabola is on the graph?

The larger the number, the more narrow the graph. The smaller the number, the wider the graph.

A quadratic in this form has a y intercept of (0, c) which also happens to be the maximum or minimum value. Because the value of ***a*** determines whether the quadratic has a maximum or minimum, we can identify a vertex from the equation. For example, identify and write the max or min value for each parabola given only the equation.

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

Parabola opens down because *a* is negative.

Vertex is $(0,1)$ and the maximum value is 1.

b) $y = \frac{1}{2}x^2 - 3$

Parabola opens up because *a* is positive.

Vertex is $(0,-3)$ and the minimum value is -3.

c) A basketball is thrown from the atrium stairs. The path can be modeled by the equation $y = -3x^2 + 27$ where x is the time in seconds and y is the height in feet.

i) What is the height the ball was thrown from?

To find this height, we use the y intercept.

The ball was thrown from 27 feet.

ii) How long does it take for the ball to reach the ground?

To find this distance, we find the x intercepts.

$y = -3x^2 + 27$

$y = -3(x^2 - 9)$

$y = -3(x+3)(x-3)$

$x = 3, -3$

*Since one of the intercepts is negative, we focus only on positive time.

The ball took 3 seconds to land.

iii) How high is the ball after only one second?

To find this height, we substitute x = 1 into our equation.

$y = -3x^2 + 27$

$y = -3(1)^2 + 27$

$y = -3 + 27$

$y = 24\ feet$

homework assignment: **Lesson 7 - 4**

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Lesson 7 – 4: Interpreting A and C in Quadratics

1. Order the following parabolas from narrowest (1) to widest (3) by placing the correct number.

a) $y = \frac{1}{3}x^2 - 7$ _____ **b)** $y = -4x^2 + 5$ _____

$y = 3x^2 - 7$ _____ $y = \frac{-1}{2}x^2 + 5$ _____

$y = x^2 - 7$ _____ $y = -0.75x^2 + 5$ _____

2. Find the y – intercept and determine if it is a maximum, a minimum, or nether.

a) $y = x^2 - 4$ **y – intercept:** _____ **max or min:** _____

b) $y = 3x^2 + 7$ **y – intercept:** _____ **max or min:** _____

c) $y = -5x^2 + 45$ **y – intercept:** _____ **max or min:** _____

d) $y = -2x^2 - 8$ **y – intercept:** _____ **max or min:** _____

e) $y = \frac{-1}{3}x^2 + 3$ **y – intercept:** _____ **max or min:** _____

f) $y = \frac{1}{2}x^2 + 5$ **y – intercept:** _____ **max or min:** _____

3. A ball is dropped from a platform. Its path can be represented by the relation $h = -5t^2 + 30$ **, where h represents the height of the ball in metres, and t represents the time in seconds taken for the ball to hit the ground.**

a) From what height was the ball dropped?

b) How long did it take the ball to reach the ground?

4, A scuba diver starts her ascent to the surface of the water. The equation that models her ascent is $d = 2.5t^2 - 250$, where d is the depth in feet below the surface ot he water, and t is the time in seconds taken to get to the surface.

a) How deep was the diver when she started to ascend?

b) How long did it take the diver to get to the surface of the water?

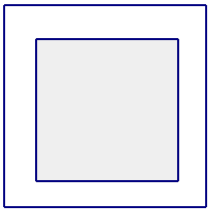
c) Suppose the diver had 20 s of air left in her scuba tank, would she reach the surface safely?

5. The shape of a skateboard ramp can be modelled by the equation $h = -0.067d^2 + 1.5$, where h is the height of the ramp in metres and d is the horizontal distance in metres from the centre of the ramp.

a) What is the maximum height of this ramp?

b) What is the total horizontal distance across this ramp?

6. A large square with sides x metres long contains a smaller square with sides 5 metres long. The relation $A = x^2 - 25$ represents the difference between the area.



a) What is the minimum possible area of the larger square.

b) If the difference between the larger and smaller area is 75m^2, find the dimensions of the larger square.