

Name: Solutions

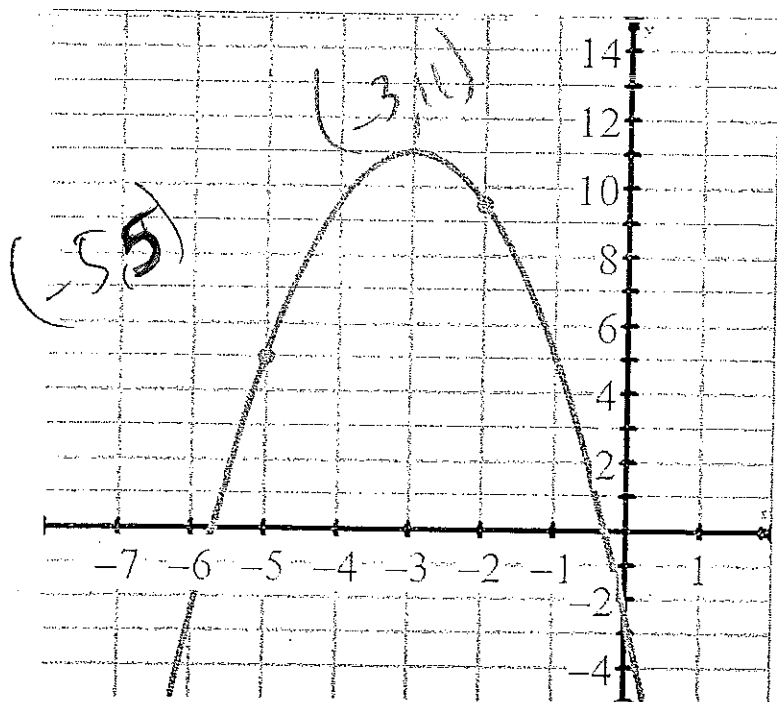
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IM 3 Quiz 3.1 V2 - Working with Quadratic Functions
Teacher: Mr. Santowski and Ms. Aschenbrenner

Score: _____

1. From the diagram of the parabola:
a. Determine its equation in vertex form. Show the key steps of your solution.

(4 marks)



$$y = a(x + 3)^2 + 11 \quad \checkmark$$

$$5 = a(-5 + 3)^2 + 11 \quad \checkmark$$

$$5 = a(-2)^2 + 11$$

$$5 - 11 = 4a$$

$$-6 = 4a \quad \checkmark$$

$$y = -\frac{3}{2}(x + 3)^2 + 11 \quad \checkmark$$

- b. Describe the transformations applied to the parent function ($y = x^2$) to create the graph above.

(3 marks)

Vertical stretched by a factor of $\frac{3}{2}$ ✓

Reflected across the x-axis ✓

Translated 3 to the right ✓

Translated 11 units up ✓

2. The following questions deal with analyzing an equation of a quadratic function in order to answer questions about the quadratic function & its features. Use any algebraic strategy in your solutions.

(8 marks)

a. Given the parabola $y = -\frac{3}{2}x^2 - 6x + 12$:

Write down the EQUATION of the axis of symmetry

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

$x = -2$

b. Determine the coordinates of the vertex of.

(2) $y(-2) = -\frac{3}{2}(-2)^2 - 6(-2) + 12$

$= -\frac{3}{2}(4) + 12 + 12$

$(-2, 18)$ $= -6 + 12 + 12$
 $= 18$

d. Write the quadratic equation

$f(x) = 2(x+6)^2 - 5$ in standard form.

(2) $= 2(x+6)(x+6) - 5$

$= 2(x^2 + 12x + 36) - 5$

$= 2x^2 + 24x + 72 - 5$

$= 2x^2 + 24x + 67$ ✓

c. Determine the x-intercepts of the quadratic

function $f(x) = 5x^2 - 13x - 6$

$\begin{matrix} 5 & \times & 2 \\ 1 & & -3 \end{matrix}$ (2)

$(5x+2)(x-3) = 0$ ✓

$x = -\frac{2}{5}$ or ✓

$x = 3$

e. Write the equation of a parabola that is narrower than the parent function, $y = x^2$, has its vertex at $(4, -2)$ and has no x-intercepts.

(1)

$y = -2(x-4)^2 - 2$ ✓

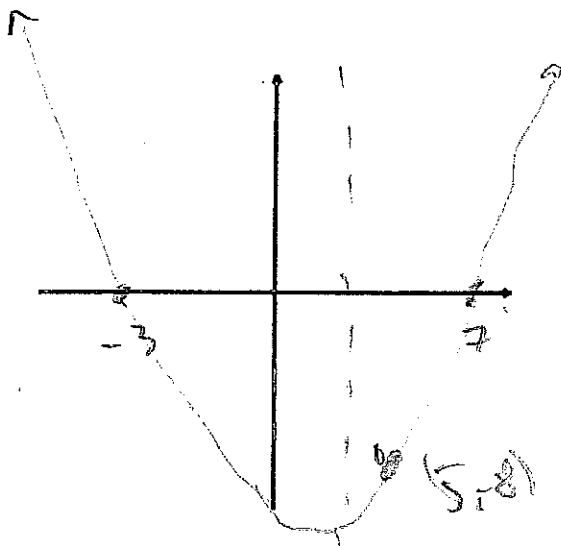
3. A parabola has x-intercepts at $x = -3$ and $x = 7$ and goes through the point $(5, -8)$.

(6 marks)

a. Provide a sketch of the parabola, given the details provided.

b. Write the equation of this parabola in vertex form, showing the key steps in your solution.

(3)



shape ✓
roots ✓
pt ✓
 $x = 2$

$$a = \frac{-3 + 7}{2} = 2$$

(3)

$$y = a(x+3)(x-7) \quad \checkmark$$

use $(5, -8)$

$$-8 = a(5+3)(5-7)$$

$$-8 = a(8)(-2)$$

$$\frac{-8}{-16} = a$$

$$\frac{1}{2} = a \quad \checkmark$$

$$y = \frac{1}{2}(x+3)(x-7) \quad \checkmark$$

use $x = 2$ to find vertex

$$y(2) = \frac{1}{2}(2+3)(2-7) \quad \checkmark$$

$$= \frac{1}{2}(5)(-5)$$

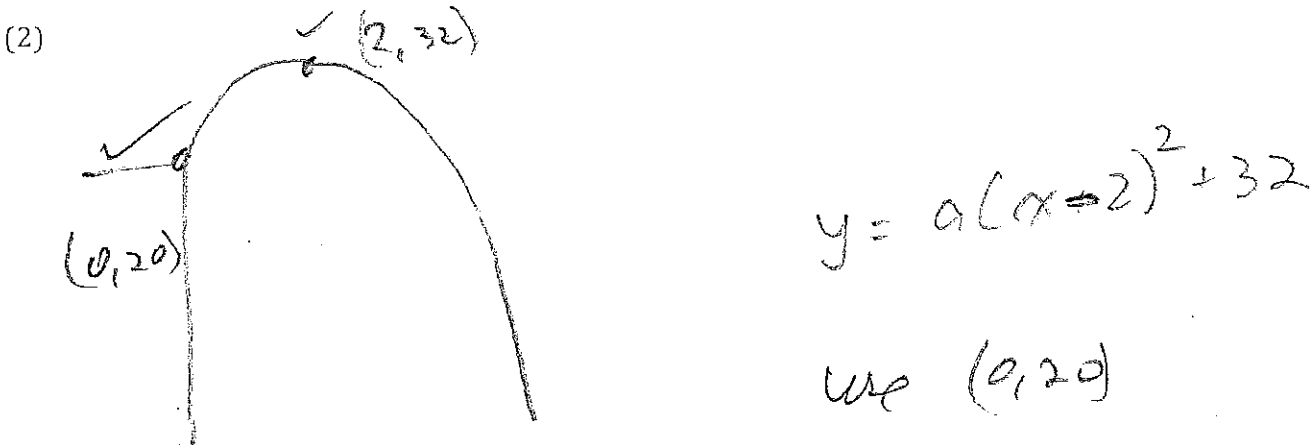
$$= -\frac{25}{2}$$

$$y = \frac{1}{2}(x-2)^2 - \frac{25}{2} \quad \checkmark$$

4. Ms. A is throwing rocks around in the Waadi. She is standing on a cliff that is 20m high and can throw a rock so that it reaches a maximum height of 32m after 2 seconds.

(7 marks)

- a. Draw a sketch of the situation making sure to LABEL all key information.



- b. Determine an equation that can be used to model the height of the rock, h in meters above the ground, as a function to time, t , in seconds since the rock was thrown. Use the variables h and t in your equation.

(3)

$$20 = a(-2)^2 + 32 \quad \checkmark \checkmark$$

$$-12 = 4a$$

$$-3 = a \quad \checkmark$$

$$h = -3(t-2)^2 + 32$$

- c. Ms. A believes that the rock will hit the Waadi floor in about 5 or 6 seconds after she throws the rock. Provide any APPROPRIATE mathematical reasoning to explain why she is (or isn't) correct.

(2)

$$0 = -3(t-2)^2 + 32 \quad \checkmark$$

$$\frac{-32}{-3} = (t-2)^2$$

$$\pm \sqrt{10.7} = t-2$$

$$2 \pm 3.3 = t \quad \checkmark$$

t between 5 or 6
[+/-] 10.7

$$h(5) = -3(3)^2 + 32 = 5 \quad \checkmark$$

$$h(6) = -3(4)^2 + 32 = -16 \quad \checkmark$$

i. hit ground in interval 5-6