NAME: _____   Date: _____

Algebra 2: Take Home (MidTerm Exam)

Directions: You can choose how many questions you are going to answer. Please circle your choice. I will only grade the number you indicate. Make sure to circle your selection. I will only grade the questions in order up to the selected amount.

- 2 Questions (30 points each)   _____ 60 Points

- 4 Questions (15 Points each)   _____ 60 Points

- 6 Questions (10 Points each)   _____ 60 Points

- 12 Questions (5 Points each)   _____ 60 Points

Completed your questions a separate sheet of paper, including all graphs when necessary. Make sure to number all of your questions and answer completely. You may choose to use a Google doc to complete your written portion.

Competency Covered:

Explain and justify reasoning when solving mathematical problems.

1. Below there are four questions. Which is different? Find "both" answers.

a. What are the vertices of the figure after a reflection in the x-axis, followed by a translation 2 units right?

b. What are the vertices of the figure after a translation 6 units up and 2 units right?

c. What are the vertices of the figure after a translation 2 units right, followed by a reflection in the x-axis?

d. What are the vertices of the figure after a translation 6 units up, followed by a reflection in the x-axis?
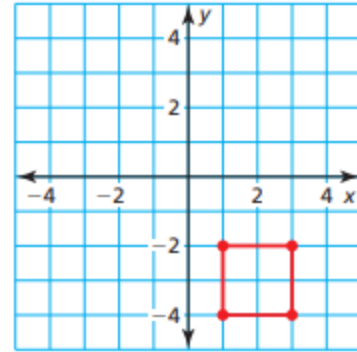
2. In the same coordinate plane, sketch the graph of the parent quadratic function and the graph of a quadratic function that has no x-intercepts. Describe the transformation(s) of the parent function.

3. Graph the functions $f(x) = |x - 4|$ and $g(x) = |x| - 4$. Are they equivalent? Explain.

4. Below you are given four transformations, which transformation does not belong with the other three? Explain your reasoning.

Translate the graph of $f(x) = 2x + 3$ up 2 units.

Shrink the graph of $f(x) = x + 5$ horizontally by a factor of $\frac{1}{2}$.

Stretch the graph of $f(x) = x + 3$ vertically by a factor of 2.

Translate the graph of $f(x) = 2x + 3$ left 1 unit.

5. Using what you know about solving linear systems in two and three variables, plan a strategy for how you would solve a system that has four linear equations in four variables.

6. A linear system in three variables has no solution. Your friend concludes that it is not possible for two of the three equations to have any points in common. Is your friend correct? Explain.

7. Two quadratic functions have graphs with vertices (2, 4) and (2, -3). Explain why you can not use the axes of symmetry to distinguish between the two functions.

8. A quadratic function is increasing to the left of x = 2 and decreasing to the right of x = 2. Will the vertex be the highest or the lowest point on the graph of the parabola? Explain.

9. Your friend claims the equation $x^2 + 7x = -49$ can be solved by factoring and has a solution of x = 7. You solve the equation by graphing the related function and claim there is no solution. Who is correct? Explain.

10. The Product Property of Square Roots states $\sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$. Your friend concludes $\sqrt{-4} \cdot \sqrt{-9} = \sqrt{36} = 6$. Is your friend correct? Explain.

11. Describe the two different methods shown for writing the complex expression in standard form. Which method do you prefer? Explain.

Method 1

$4i(2 - 3i) + 4i(1 - 2i) = 8i - 12i^2 + 4i - 8i^2$

$\qquad\qquad\qquad\qquad\quad = 8i - 12(-1) + 4i - 8(-1)$

$\qquad\qquad\qquad\qquad\quad = 20 + 12i$

Method 2

$4i(2 - 3i) + 4i(1 - 2i) = 4i[(2 - 3i) + (1 - 2i)]$

$\qquad\qquad\qquad\qquad\quad = 4i[3 - 5i]$

$\qquad\qquad\qquad\qquad\quad = 12i - 20i^2$

$\qquad\qquad\qquad\qquad\quad = 12i - 20(-1)$

$\qquad\qquad\qquad\qquad\quad = 20 + 12i$

12. Your friend says the equation $x^2 + 10x = -20$ can be solved by either completing the square or factoring. Is your friend correct? Explain.

13. The class is asked to solve the equation $4x^2 + 14x + 11 = 0$. You decide to solve the equation by completing the square. Your friend decides to use the Quadratic Formula. Whose method is more efficient? Explain your reasoning.

14. A truck is 11 feet tall and 7 feet wide is traveling under an arch. The arch can be modeled by $y = -0.0625x^2 + 1.25x + 5.75$, where x and y are measured in feet.
   a. Will the truck fit under the arch? Explain.

   b. What is the maximum width that a truck 11 feet tall can have and still make it under the arch?

   c. What is the maximum height that a truck 7 feet wide can have and still make it under the arch?

15. You claim the system of inequalities below, where *a* and *b* are real numbers, has no solution. Your friend claims the system will always have at least one solution. Who is correct? Explain.

$$y < (x + a)^2$$
$$y < (x + b)^2$$