MPM2D – Unit 2: The Quadratic Relation
Review Worksheet – Part 3

1. Convert each quadratic equation below from vertex form into standard form by expanding and simplifying.

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

   b) $y = \frac{1}{3}(x-8)^2 - 13$

2. Determine the number of x-intercepts (0, 1 or 2) on each quadratic relation.

   a) $y = -\frac{1}{7}(x-9)^2$

   b) $y = (x+6)^2 + 5$

   c) $y = -3x^2 - 1$

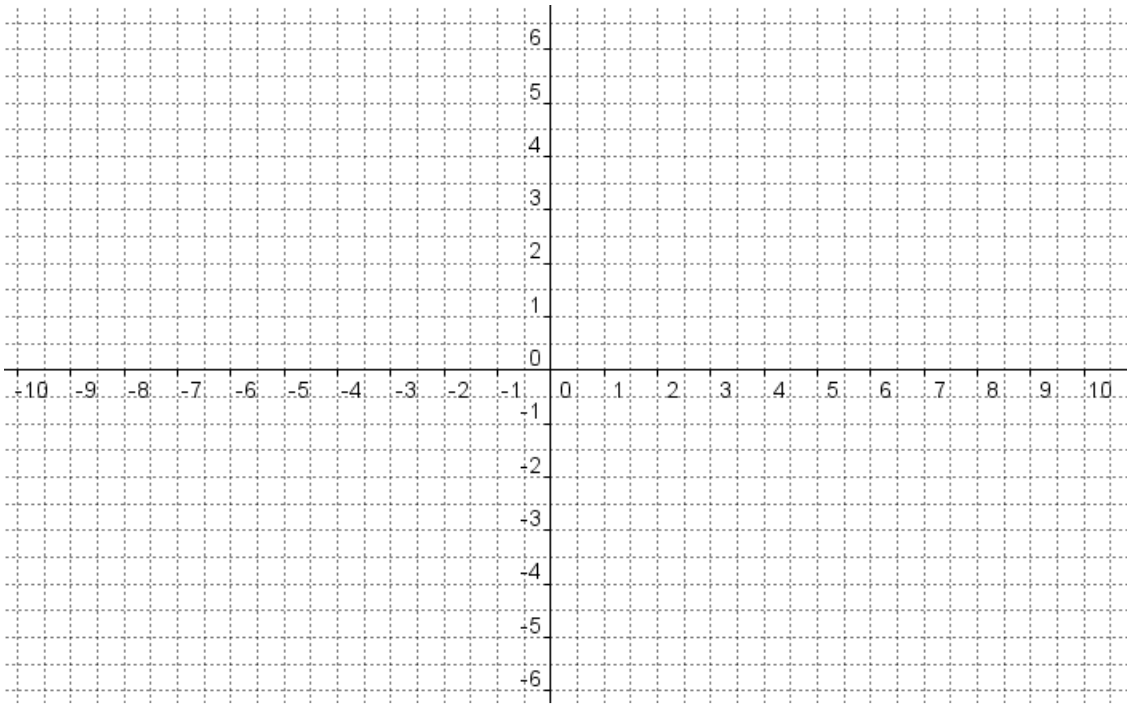
   d) $y = -(x-4)^2 + 10$

3. Complete the following table.

Equation	Vertex	Over 1 Points	Over 2 Points	Max/Min Point	Max/Min Value	Axis of Symmetry
$y = -\frac{1}{7}(x-9)^2$						
$y = -3x^2 - 1$						

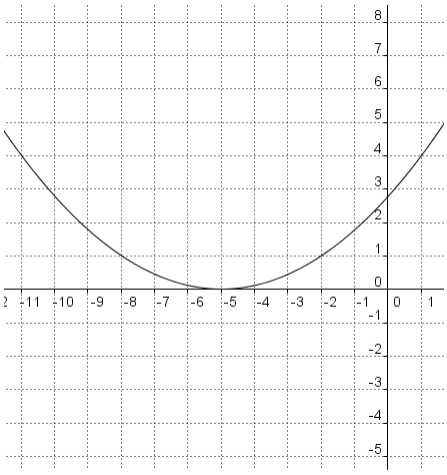
4. Graph the quadratic relations listed below on the 0.5 by 0.5 grid provided. Each graph should have at least five points.

a) $y = -(x+4)^2 + 3$ b) $y = -\frac{1}{4}(x+2)^2 + 6$ c) $y = \frac{3}{2}(x-7)^2 - 5$

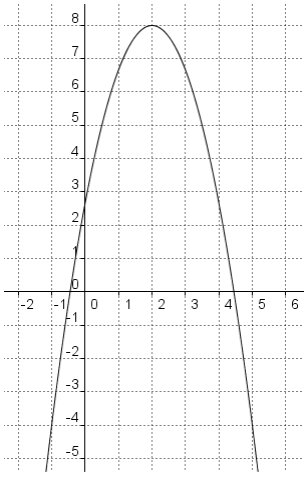


5. State the equation of each transformed quadratic relation. Justify your answers.

a)



b)



6. The height, *h metres*, of an object thrown at a speed of 18 m/s and an angle of 45° above the ground was modeled by the equation $h = -4.9(t - 1.3)^2 + 10.45$ where *t seconds* was the time since the object was launched.

   a) What was the maximum height the object reached?

   b) When did the object reach its maximum height?

   c) What was the initial height of the object?

   d) When did the object hit the ground?

   e) When was the object at a height of 7 m above the ground?

   f) On a separate page, sketch a graph to represent this scenario.
   Include all information on the sketch that you determined in parts a) to e).

7. Describe the transformations applied to each parabola. Use proper terminology in your descriptions.

a) $y = -4(x-7)^2$

b) $y = \frac{1}{5}(x+6)^2 + 3$

8. Determine the equation for a quadratic relation given the following information.

a) It has the same vertex as $y = 0.5(x+3)^2 + 4$ but is vertically reflected and has a vertical stretch factor of 6.

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b) It has a maximum value of $y = 12$, an axis of symmetry of $x = 7$ and a vertical compression factor of $\frac{3}{8}$.

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9. Explain the difference between how you determine the initial height of a projectile and how you determine when the projectile hit the ground.

10. Complete the following questions from the textbook:

p. 172 # 1, 3, 9.

p. 178 # 1ab, 4cdfh, 6, 7, 8.

p. 185 # 2bdh, 4, 5, 7, 8, 9, 10, 12, 13, 14.

p. 204 # 1, 3, 7

Answers:

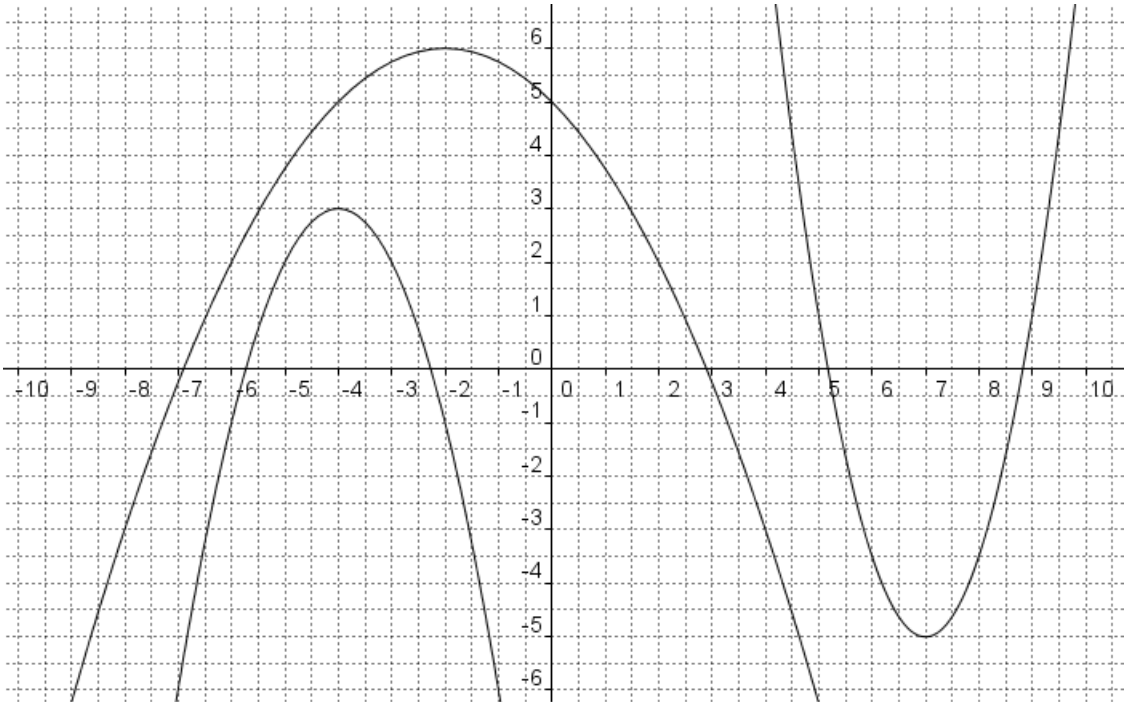
1. a) $y = -3x^2 + 24x - 43$ b) $y = \frac{1}{3}x^2 - \frac{16}{3}x + \frac{25}{3}$

2. a) one x-intercept (because the vertex is on the x-axis)
   b) no x-intercepts (because the vertex is above the x-axis and it opens up)
   c) no x-intercepts (because the vertex is below the x-axis and it opens down)
   d) two x-intercepts (because the vertex is above the x-axis and it opens down)

3. The table is completed below:

Equation	Vertex	Over 1 Points	Over 2 Points	Max/Min Point	Max/Min Value	Axis of Symmetry
$y = -\frac{1}{7}(x-9)^2$	(9, 0)	Down $\frac{1}{7}$	Down $\frac{4}{7}$	Max	y = 0	x = 9
$y = -3x^2 - 1$	(0, -1)	Down 3	Down 12	Max	y = -1	x = 0

4. The three quadratic relations are shown in the following graph:



5. a) $y = \frac{1}{9}(x+5)^2$ b) $y = -\frac{4}{3}(x-2)^2 + 8$

6. a) The maximum height the object reached was 10.45 metres.

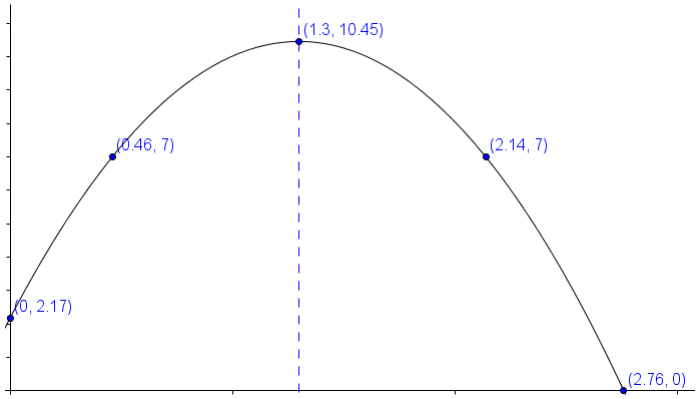
b) The object reach its maximum height 1.3 seconds after it was launched.

c) The initial height of the object was 2.17 metres (when it was launched).

d) The object hit the ground 2.76 seconds after it was launched.

e) The object reached a height of 7 m after 0.46 s and also after 2.14 s.

f) The following sketch includes all information determined in parts a) to e):



7. a) The base graph has been vertically reflected, vertically stretched by a factor of 4 and horizontally translated 7 units to the right in order to create $y = -4(x-7)^2$.

b) The base graph has been vertically stretched by a factor of $\frac{1}{5}$ (ie., vertically compressed), vertically translated 3 units up and horizontally translated 6 units to the left in order to create $y = \frac{1}{5}(x+6)^2 + 3$.

8. a) $y = -6(x+3)^2 + 4$ b) $y = -\frac{3}{8}(x-7)^2 + 12$

9. In order to determine the initial height of a projectile you need to substitute t = 0 and then solve for h using order of operations (BEDMAS). In order to determine when the projectile hit the ground you need to set h = 0 and then solve for t using opposite operations (SAMDEB).

10. The answers begin on page 527 in the textbook.