Name: _____   Date: _____

Chapter 6 Review

6.1 Minima and Maxima

1. Rewrite each relation in the form
    $y = a(x - h)^2 + k$ by completing the square.
    Use algebra tiles or a diagram to support
    your solution.
    a) $y = x^2 + 6x + 3$
    b) $y = x^2 + 4x - 1$
    c) $y = x^2 + 8x + 7$
    d) $y = x^2 + 10x - 5$

2. Find the vertex of each quadratic relation.
    Sketch a graph of the relation, labelling the
    vertex, the axis of symmetry, and two other
    points.
    a) $y = x^2 + 14x - 7$
    b) $y = -x^2 + 6x + 1$
    c) $y = 2x^2 + 12x + 4$
    d) $y = -x^2 + 16x + 3$

3. Use a graphing calculator to find the
    minimum or maximum value for each
    quadratic relation. Round your answer to the
    nearest tenth, if necessary.
    a) $y = 2x^2 + 3x + 5$
    b) $y = 0.3x^2 + 0.9x + 9$
    c) $y = \dfrac{1}{4}x^2 - \dfrac{1}{8}x + \dfrac{1}{4}$
    d) $y = -2x^2 + 8x + 5$

4. The path of a basketball can be modelled by
    the equation $h = -0.06d^2 + 0.6d + 3$, where
    h represents the height, in metres, of the ball
    above the ground and d represents the
    horizontal distance, in metres, that the ball
    travels.
    a) What is the maximum height reached by
    the ball?
    b) What horizontal distance has the ball
    travelled when it reaches this maximum
    height?

6.2 Solve Quadratic Equations

5. Solve by factoring. Check your solutions.
    a) $x^2 + 2x - 15 = 0$
    b) $m^2 - 13m + 36 = 0$
    c) $4y^2 - 8y - 5 = 0$
    d) $15c^2 - 8c - 12 = 0$

6. Solve.
    a) $y^2 + 2y = 8$
    b) $5x^2 = -8x - 3$
    c) $4z^2 = 1$
    d) $10m^2 - 40m = 0$
    e) $8x^2 - 40 = 22x$
    f) $-18x^2 + 39x = -15$

7. Write a quadratic equation in the form
    $ax^2 + bx + c = 0$, where a, b, and c are
    integers, given the following roots.
    a) 5 and -3
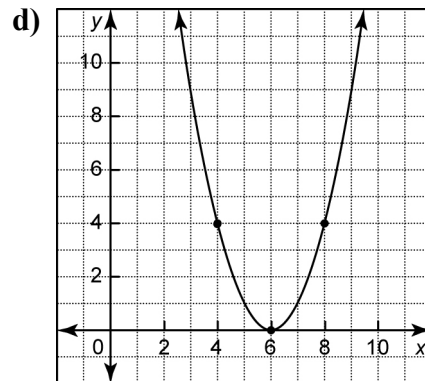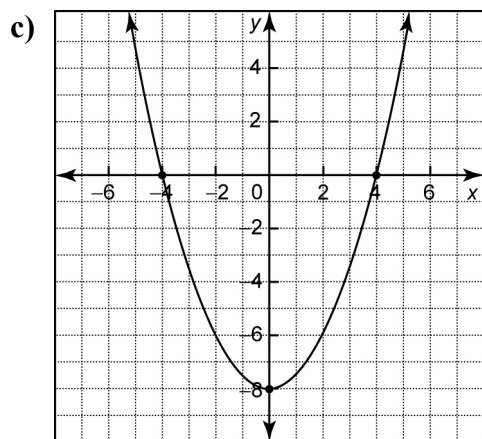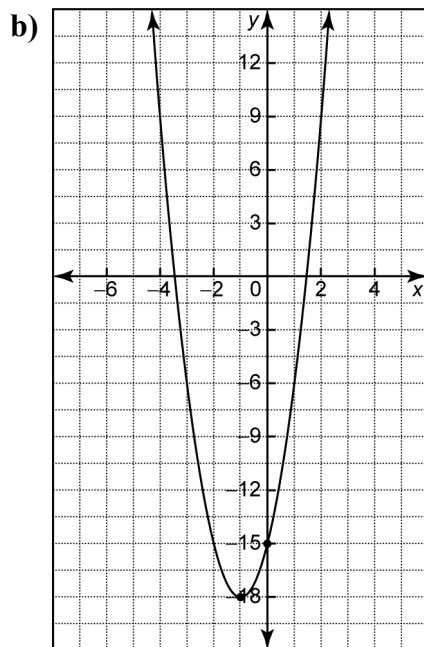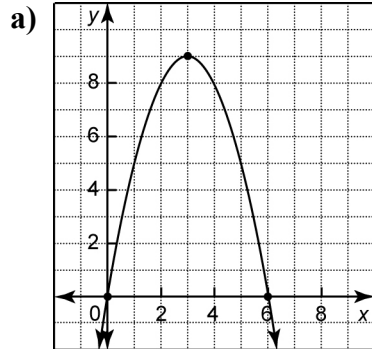   **b)** $-\dfrac{1}{3}$ and $\dfrac{2}{5}$

6.3 Graph Quadratics Using the *x*-Intercepts

8. Find the *x*-intercepts and the vertex of each
    quadratic relation. Sketch each graph.
    a) $y = x^2 + 6x + 9$
    b) $y = 25x^2 - 9$
    c) $y = -x^2 + 4x + 21$
    d) $y = x^2 + 12x + 32$
    e) $y = -2x^2 + 4x + 48$
    f) $y = 20x^2 - 5$

9. Write an equation in the form $y = ax^2 + bx + c$ to represent each parabola.

a)

b)

c)

d)

10. A parabola has a vertex $(-3, 4)$ and one x-intercept is -1. Find the other x-intercept and the y-intercept.

6.4 The Quadratic Formula

11. Use the quadratic formula to solve each equation. Express your answers as exact results.
a) $x^2 + 5x + 2 = 0$
b) $3x^2 + x - 1 = 0$
c) $-x^2 - 6x + 4 = 0$
d) $5x^2 - 3x - 4 = 0$
e) $2x^2 + 3x - 7 = 0$
f) $3x^2 - x - 1 = 0$
g) $2x^2 + x - 5 = 0$
h) $0 = -3x^2 + 3x + 1$

12. For each quadratic relation, state the coordinates of the vertex and the direction of opening and determine the number of x-intercepts.
a) $y = 3(x + 1)^2 + 1$
b) $y = -\dfrac{1}{2}(x + 2)^2 + 3$
c) $y = \dfrac{2}{3}(x - 3)^2$
d) $y = -3(x + 4)^2 - 2$

13. A toy rocket is launched from a platform that is 2 m off the ground at an initial velocity of 17.4 m/s. The height, h, in metres, of the rocket t seconds after it is launched is given by the equation $h = -4.9t^2 + 17.4t + 2$.
   a) How long will it take the toy rocket to reach a height of 9 m, to the nearest tenth of a second?
   b) When will the toy rocket fall back to the height of 9 m, to the nearest tenth of a second?
   c) Using your answers from parts a) and b), find the time when the rocket will reach its maximum height and determine this maximum height. Round to the nearest tenth.

6.5 Solve Problems Using Quadratic Equations

14. If the product of two consecutive even numbers is 8648, what are the two numbers?

15. A garden against the wall of a house is to be surrounded on three sides by a total of 336 m of fencing. What dimensions of the garden will result in an area of 14 112 m^2?

16. If part of a photograph is used to fill an available space in a book or magazine, the photograph is said to be cropped. A photograph that was originally 15 cm by 10 cm is cropped by removing the same width from the top and the left side. Cropping reduces the area of the photograph by 46 cm^2. What are the dimensions of the cropped photograph?

17. A set of p non-collinear points (points not in a straight line) can be connected by a maximum of $\dfrac{p^2 - p}{2}$ line segments.
   a) Find the number of non-collinear points that can be connected by a maximum of 55 line segments.
   b) Is it possible for a set of non-collinear points to be connected by a maximum of 40 line segments?

18. The acceleration due to gravity on Earth is 9.8 m/s^2. A tennis ball is hit into the air at an initial velocity of 25 m/s from a height of 0.7 m above the ground.
   a) Write an equation for the height, h, in metres, of the tennis ball in terms of the time, t, in seconds, it has been in the air.
   b) Find the height of the tennis ball 1.5 s after it was hit, to the nearest tenth of a metre.
   c) Find the maximum height of the tennis ball and when it occurs. Round to the nearest tenth.

19. Need-a-Ride is a car rental agency that rents 400 cars a week at $80 per car. Industry research has shown that for every $2 increase in rental price, an agency will rent eight fewer cars.
   a) Total revenue is the product of the price per rental and the number of vehicles rented. Write an expression to represent the revenue for the rental agency.
   b) Find the maximum revenue.
   c) For this revenue, how many cars are rented and how much is the rental price per car?