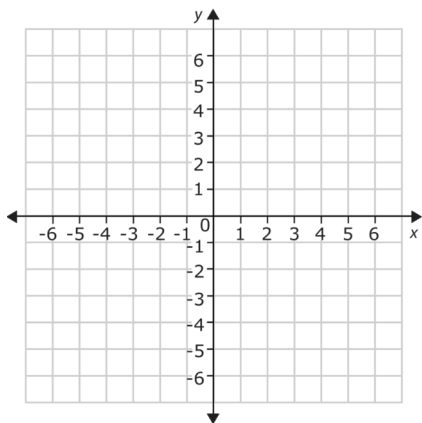# Quadratics Proficiency Test

1. For the following functions, graph and identify the vertex, axis of symmetry, and x-intercepts.

   (3 pts each)

   a. $f(x) = x^2 - 5$

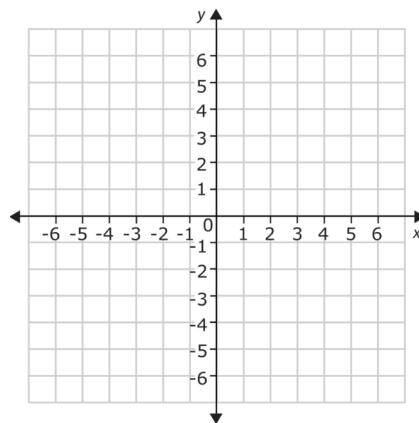   vertex:

   axis of symmetry:

   x-intercepts:

   b. $g(x) = 7 - x^2$
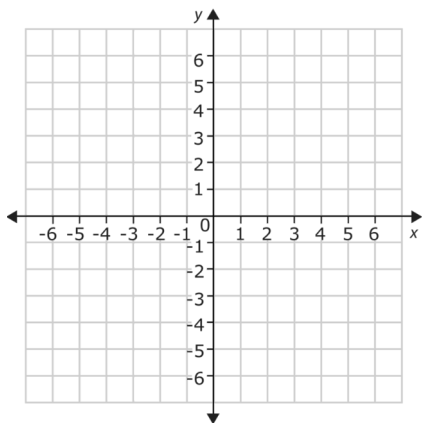

   vertex:

   axis of symmetry:

   x-intercepts:

   c. $h(x) = \frac{1}{2}x^2 - 4$
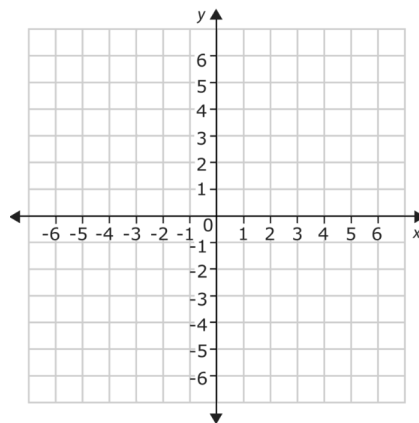

   vertex:

   axis of symmetry:

   x-intercepts:

   d. $i(x) = (x + 5)^2 - 6$
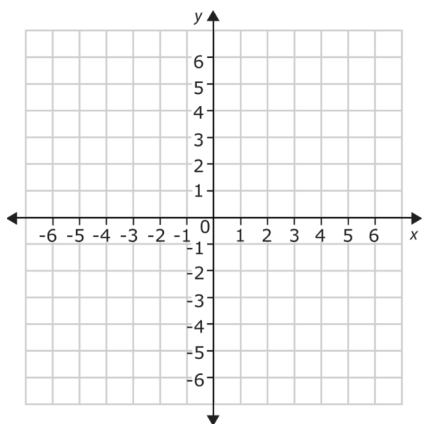

   vertex:

   axis of symmetry:

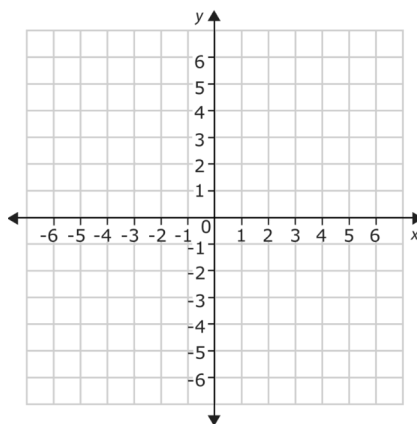   x-intercepts:

e. $j(x) = -x^2 + 2x + 5$

vertex:

axis of symmetry:

x-intercepts:

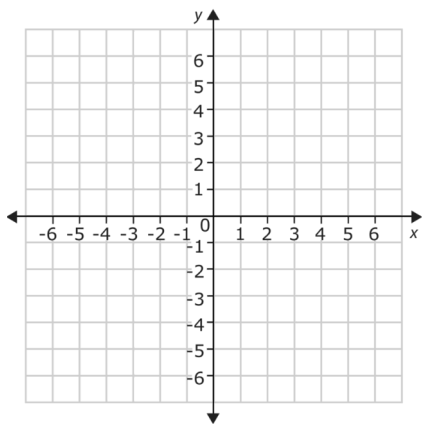f. $k(x) = 4x^2 - 4x + 1$

vertex:

axis of symmetry:

x-intercepts:
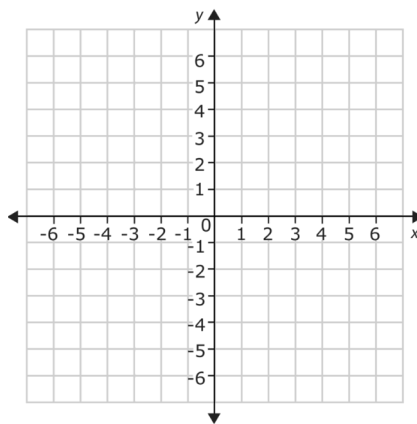
g. $l(x) = 2x^2 - x + 1$

vertex:

axis of symmetry:

x-intercepts:

h. $m(x) = -\frac{1}{3}x^2 + 3x - 6$

vertex:

axis of symmetry:

x-intercepts:

2. Write the standard form of the equation of the parabola that has the indicated vertex and whose

   graph passes through the given points. (Hint: Use vertex form.) (3 pts each)

   a. vertex: $(-2,\ 5)$, point: $(0,\ 9)$ b. vertex: $(3,\ 4)$, point: $(1,\ 2)$

   c. vertex: $(-2,\ -2)$, point: $(-1,\ 0)$ d. vertex: $(2,\ 3)$, point: $(0,\ 2)$

   e. vertex: $(5,\ 12)$, point: $(7,\ 15)$

3. Find two quadratic functions, one that opens upward, and one that opens downward, whose

   graphs have the given x-intercepts. (There are many correct answers.) (3 pts each)

   a. $(-1,\ 0), (3,\ 0)$ b. $(4,\ 0), (8,\ 0)$

   c. $(-3,\ 0), \left(-\dfrac{1}{2},\ 0\right)$ d. $\left(-\dfrac{5}{2},\ 0\right), (2,\ 0)$

4. A ball is thrown into the air from the edge of a building, 50 ft above the ground. It has an initial upwards velocity of 20 ft/s. Given the equation $h = -16t^2 + vt + k$, where h is the height of the ball, t is seconds since the ball was thrown, v is the initial vertical velocity, and k is the height from which the ball was thrown, how long would it take for the ball to hit the ground? (7 pts)

5. Solve by completing the square. (3 pts each)

   a. $4x^2 + 4x = 15$

   b. $x^2 + 2x = \dfrac{21}{4}$

   c. $x^2 + \dfrac{8}{3}x - 1 = 0$

   d. $x^2 - 28x = -196$

   e. $x^2 - 2x = 3$

   f. $x^2 + 3x = -\dfrac{5}{4}$

   g. $x^2 + 2x - 35 = 0$

   h. $x^2 - 2x + \dfrac{3}{4} = 0$

6. Solve for x using the zero product property. (Hint: Factor by GCF.) (3 pts each)

a. $x^3 = 9x$

b. $5x^4 - 25x^2 + 20 = 0$

c. $x^3 - 3x^2 = 0$

d. $\dfrac{1}{2}\left(x^2 + x\right) = 1$

e. $x^4 - x^3 - 20x^2 = 0$

f. $x^6 = 64$

Extra Credit! Richy has 36 m of fence. He wants to use it to enclose a rectangular garden, with an additional fence down the middle to separate his fruits from his vegetables. What dimensions will maximize the area of his garden? (Hint: Create two equations for perimeter and area.) (10 pts)