Name: _____   Date: _____

Section 3.1 Complete the Square

1. True or False.
   a) The vertex form of a quadratic function is
   $y = a(x - h)^2 + k$.
   b) $x^2 + 2x + 2$ represents a perfect square trinomial.
   c) $y = x^2 + 4x + 5$ is equivalent to
   $y = (x + 2)^2 + 1$.
   d) The vertex form of the quadratic function
   $y = 2x^2 - 4x + 7$ is $y = 2(x - 1)^2 + 5$.
   e) The standard form of a quadratic function is
   $y = ax^2 + bx + c$.

2. Write each quadratic function in vertex form by completing the square.
   a) $y = x^2 + 8x + 3$ **b)** $y = x^2 - 2x + 7$
   c) $y = x^2 - 4x - 1$ **d)** $y = x^2 + 10x - 2$
   e) $y = x^2 + 6x + 4$ **f)** $y = x^2 - 6x + 9$

3. Write each quadratic function in vertex form by completing the square.
   a) $y = 2x^2 - \dfrac{4}{5}x + \dfrac{3}{25}$

   b) $y = 4x^2 + \dfrac{8}{3}x + \dfrac{4}{9}$

   c) $y = \dfrac{1}{2}x^2 + 3x + 18$

   d) $y = \dfrac{3}{5}x^2 + \dfrac{6}{5}x - 5$

   e) $y = -x^2 - \dfrac{2}{7}x$

   f) $y = -\dfrac{5}{2}x^2 - 5x + \dfrac{1}{4}$

4. Find the value of d that makes each expression a perfect square trinomial.
   a) $y = x^2 - 2x + d$ **b)** $y = x^2 + 8x + d$
   c) $y = x^2 - 5x + d$ **d)** $y = x^2 + 7x - d$
   e) $y = x^2 + 6x - 3d$ **f)** $y = x^2 - 3x + 4d$

5. Find the vertex of each quadratic function by completing the square. Identify the vertex as either a maximum or a minimum.
   a) $y = x^2 + 6x + 5$
   b) $y = x^2 - 2x + 10$
   c) $y = -x^2 + 8x$
   d) $y = -x^2 + 12x + 2$
   e) $y = -4x^2 - 24x + 4$
   f) $y = (x + 1)(x - 3)$

6. A tennis player hits a lob. The path of the ball can be represented by the function
$h(d) = -0.03d^2 + 0.75d + 0.38$, where h is the height of the ball above ground, in metres, at a distance d metres from the player.
   a) Sketch a graph of the path of the ball.
   b) What is the maximum height of the ball?
   c) At what distance does the ball reach its maximum height?
   d) The player's opponent is standing 20 m from her. If her opponent can reach a maximum height of 3 m with her racquet, how much higher is the ball than the opponent's racquet?

7. Carol's Cakes sells an average of 100 cakes per day at $4.00 each. Carol conducted a survey and found that for every $0.25 increase in the price of a cake, eight fewer customers would purchase a cake in a given day.
   a) At what price should Carol sell the cakes to maximize revenue?
   b) How many cakes can Carol expect to sell each day at this ideal price?
   c) What is the maximum possible revenue Carol could generate?

8. Write the quadratic function $y = x^2 + kx + \dfrac{1}{4}k^2$

in vertex form.