1. [10 pts. each] Solve each equation by the indicated method.

   (a) $9x^2 = 12x - 4$ (by using the zero-factor property)

   (b) $(x + 5)^2 = -3$ (by using the square root property)

   (c) $-3x^2 + 9x = 7$ (by completing the square)

2. [10 pts.] Solve
$$S = 2\pi rh + 2\pi r^2$$
   for r using the quadratic formula.

3. [15 pts.] A box with no top and a square base is to be made from a piece of cardboard by cutting 3-cm squares from each corner and folding up the sides. The volume of the box is to be 48 cm^3. What size should the piece of cardboard be?

4. [15 pts.] A nature conservancy group wants to construct a raised wooden walkway through a wetland. To enclose the most scenic part of the wetland, the walkway will have the shape of a right triangle with one leg 700 meters longer than the other, and the hypotenuse 100 meters longer than the longer leg. Find the total length of the walkway.

5. [10 pts.] If a faucet can fill a sink in 7 minutes when the drain is closed, and the drain can empty the sink in 9 minutes when the faucet is off, how long would it take to fill the sink if the faucet is on while the drain is open?

6. [10 pts. each] Solve each equation.

   (a) $2 = \dfrac{3}{2x - 1} - \dfrac{1}{(2x - 1)^2}$

   (b) $\dfrac{y}{y - 3} = \dfrac{3}{y - 3} + 3$

   (c) $\sqrt{3x} = \sqrt{5x + 1} - 1$

   (d) $3 - \sqrt{x} = \sqrt{2\sqrt{x} - 3}$

   (e) $6(z + 2)^4 - 11(z + 2)^2 = -4$

   (f) $\left| \dfrac{5}{t - 3} \right| = 10$

7. $\boxed{\text{10 pts. each}}$ Solve each inequality. Write each solution set in interval notation.

(a) $6x - (3 - 2x) \le 3x - 7$

(b) $-\dfrac{1}{2} < \dfrac{4 - 3x}{5} \le \dfrac{1}{4}$

(c) $x^2 + 5x + 6 > 0$

(d) $\dfrac{2x + 1}{x - 5} \le 3$

(e) $|4 - 3x| > 2$

(f) $|5 - x| \le 12$

8. $\boxed{\text{10 pts.}}$ Show algebraically that the points $P(-1, 3)$, $Q(3, 11)$, and $R(5, 15)$ are collinear.

9. $\boxed{\text{10 pts.}}$ Write
$$x^2 - 12x + y^2 + 10y = -25$$
in Center-Radius form, then give the center and radius of the circle.