

## Chapter 7 Test

- 1)  $3x^2 = 12$   
 $x^2 = 4$  Extract the square  
 $x = \pm\sqrt{4}$   
 $x = \pm 2$
- 3)  $x^2 - 8x = -12$   
 $x^2 - 8x + 12 = 0$   
 $x^2 - 2x - 6x + 12 = 0$  Split the middle term  
 $(x^2 - 2x) + (-6x + 12) = 0$  Group the terms  
 $x(x - 2) + (-6)(x - 2) = 0$  Factor out GCF of each group  
 $(x - 2)(x - 6) = 0$  Factor out common binomial  
 $x - 2 = 0$  or  $x - 6 = 0$  Zero factor principle  
 $x = 2$  or  $x = 6$
- 5)  $x^2 + 2nx = k$   
 $x^2 + 5x = 13$  Quadratic with  $2n = 5, k = 13$   
 $x^2 + 5x + \frac{25}{4} = 13 + \frac{25}{4}$   $2n = 5, n = \frac{5}{2}, n^2 = \frac{25}{4}$   
 $x^2 + 5x + \frac{25}{4} = \frac{77}{4}$  Left side is a perfect square trinomial  
 $(x + \frac{5}{2})^2 = \frac{77}{4}$   
 $x + \frac{5}{2} = \pm\sqrt{\frac{77}{4}}$   
 $x = -\frac{5}{2} \pm \sqrt{\frac{77}{4}}$
- 7)  $y = -3x^2 - x + 9$  Quadratic with  $a = -3, b = -1, c = 9$
- a) Since  $a = -3 < 0$ , the parabola has a maximum.
- b)  $x = \frac{-b}{2a} = \frac{-(-1)}{2(-3)} = \frac{1}{-6} = -\frac{1}{6}$   
 $y = -3(-\frac{1}{6})^2 - (-\frac{1}{6}) + 9 = -3(\frac{1}{36}) + \frac{1}{6} + 9 = -\frac{3}{36} + \frac{1}{6} + 9 = \frac{109}{12}$   
Vertex is  $(-\frac{1}{6}, \frac{109}{12})$
- c) Discriminant  $= b^2 - 4ac = (-1)^2 - 4(-3)(9) = 1 + 108 = 109$   
 $109 > 0$ , so the quadratic has 2 real roots
- d) Roots are approximately  $-1.9, 1.6$ .
- e)  $(0, 9)$

9)  $h = -4.9t^2 + 15t + 1.5$  Quadratic with  $a = -4.9$ ,  $b = 15$ ,  $c = 1.5$

a) The water's maximum height is the  $h$ -coordinate of the vertex.

$$t = \frac{-b}{2a} = \frac{-(15)}{2(-4.9)} = \frac{15}{9.8}$$

Substitution of  $\frac{15}{9.8}$  for  $t$  into the quadratic gives  $h = 12.98$  ft

b) 1.5 meters

c) The water hits the ground when  $h = -4.9t^2 + 15t + 1.5 = 0$ .

$$t = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$t = \frac{-(15)}{2(-4.9)} \pm \frac{\sqrt{(15)^2 - 4(-4.9)(1.5)}}{2(-4.9)}$$

$$t = \frac{15}{9.8} \pm \frac{\sqrt{225 - (-254.4)}}{-9.8}$$

$$t = \frac{15}{9.8} \pm \frac{\sqrt{479.4}}{-9.8}$$

$$t = \frac{15}{9.8} \mp \frac{\sqrt{479.4}}{9.8}$$

$$t = \frac{15}{9.8} + \frac{\sqrt{479.4}}{9.8} \quad 3.76 \text{ sec}$$

(Negative root must be ignored here since we can't have negative time).

11)

a)  $-5.2P^2 + 70P = 0$

$P(-5.2P + 70) = 0$  Factor out common monomial

$P = 0$  or  $-5.2P + 70 = 0$  Zero factor principle

$P = 0$  or  $-5.2P = -70$

$P = 0$  or  $P = 13.46$

No revenue is generated when the product sells for \$0 and \$13.46.

b) The price that generates maximum revenue is the  $P$ -coordinate of the vertex:

$$P = \frac{-(70)}{2(-5.2)} = \frac{70}{10.4} \quad \$6.73$$