

7.7 Foundations of Math II

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

p. 427 # 2-4, 7

2. a) $x^2 + 5x - 6 = 0$

$a = 1$

$b = 5$

$c = -6$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(1)(-6)}}{2(1)}$$

$$x = \frac{-5 \pm \sqrt{25 + 24}}{2}$$

$$x = \frac{-5 \pm \sqrt{49}}{2}$$

$$x = \frac{-5 \pm 7}{2}$$

$$x = \frac{-5 + 7}{2} \text{ or } \frac{-5 - 7}{2}$$

$$x = \frac{2}{2} \text{ or } \frac{-12}{2}$$

$$x = 1 \text{ or } -6$$

b) $4x + 9x^2 = 0$

$a = 9$

$b = 4$

$c = 0$

$$x = \frac{-4 \pm \sqrt{4^2 - 4(9)(0)}}{2(9)}$$

$$x = \frac{-4 \pm \sqrt{16}}{18}$$

$$x = \frac{-4 \pm 4}{18}$$

$$x = \frac{-4 + 4}{18} \text{ or } \frac{-4 - 4}{18}$$

$$x = \frac{0}{18} \text{ or } \frac{-8}{18}$$

$$x = 0 \text{ or } -\frac{4}{9}$$

p. 427 cont.

2. c) $25x^2 - 121 = 0$

$a = 25$

$b = 0$

$c = -121$

$$x = \frac{-0 \pm \sqrt{0^2 - 4(25)(-121)}}{2(25)}$$

$$x = \frac{0 \pm \sqrt{0 + 12100}}{50}$$

$$x = \frac{\pm \sqrt{12100}}{50}$$

$$x = \pm \frac{110}{50}$$

$$x = \frac{110}{50} \quad \text{or} \quad -\frac{110}{50}$$

$$x = \frac{11}{5} \quad \text{or} \quad -\frac{11}{5}$$

d) $12x^2 - 17x - 40 = 0$

$a = 12$

$b = -17$

$c = -40$

$$x = \frac{-(-17) \pm \sqrt{(-17)^2 - 4(12)(-40)}}{2(12)}$$

$$x = \frac{17 \pm \sqrt{289 + 1920}}{24}$$

$$x = \frac{17 \pm \sqrt{2209}}{24}$$

$$x = \frac{17 \pm 47}{24}$$

$$x = \frac{17 + 47}{24} \quad \text{or} \quad \frac{17 - 47}{24}$$

$$x = \frac{64}{24} \quad \text{or} \quad -\frac{30}{24}$$

$$x = \frac{8}{3} \quad \text{or} \quad -\frac{5}{4}$$

3. a) $x^2 + 5x - 6 = 0$

$(x+6)(x-1) = 0$

$x+6=0, x-1=0$

$x = -6 \quad x = 1$

factoring is faster
and less writing

b) $4x + 9x^2 = 0$

$x(4+9x) = 0$

$x=0, 4+9x=0$

$9x = -4$

$x = -\frac{4}{9}$

factoring is
faster and less writing

p. 427 cont.

3.

$$\begin{aligned}
 c) \quad 25x^2 - 121 &= 0 \\
 (5x-11)(5x+11) &= 0 \\
 5x-11 &= 0, \quad 5x+11 = 0 \\
 5x &= 11 \quad 5x = -11 \\
 x &= \frac{11}{5} \quad x = -\frac{11}{5}
 \end{aligned}$$

factoring is faster

$$\begin{aligned}
 d) \quad 12x^2 - 17x - 40 &= 0 && 480 \text{ mult} \\
 12x^2 + 15x - 32x - 40 &= 0 && -17 \text{ add} \\
 3x(4x+5) - 8(4x+5) &= 0 && 12, -40 \\
 (4x+5)(3x-8) &= 0 && 16, -30 \\
 4x+5 &= 0, \quad 3x-8 = 0 && \text{15; 32} \\
 4x &= -5 \quad 3x = 8 \\
 x &= -\frac{5}{4} \quad x = \frac{8}{3}
 \end{aligned}$$

Quadratic formula takes less guesswork

4.

$$\begin{aligned}
 a) \quad 3x^2 + 5x &= 9 \\
 3x^2 + 5x - 9 &= 0 \\
 a &= 3 \\
 b &= 5 \\
 c &= -9
 \end{aligned}$$

$$x = \frac{-5 \pm \sqrt{5^2 - 4(3)(-9)}}{2(3)}$$

$$x = \frac{-5 \pm \sqrt{25 + 108}}{6}$$

$$x = \frac{-5 \pm \sqrt{133}}{6}$$

$$x = \frac{-5 + \sqrt{133}}{6} \text{ or } \frac{-5 - \sqrt{133}}{6}$$

$$\begin{aligned}
 b) \quad 1.4x - 3.9x^2 &= -2.7 \\
 -3.9x^2 + 1.4x + 2.7 &= 0 \\
 a &= -3.9 \\
 b &= 1.4 \\
 c &= 2.7
 \end{aligned}$$

$$x = \frac{-1.4 \pm \sqrt{(1.4)^2 - 4(-3.9)(2.7)}}{2(-3.9)}$$

$$x = \frac{-1.4 \pm \sqrt{1.96 + 42.12}}{-7.8}$$

$$x = \frac{-1.4 \pm \sqrt{44.08}}{-7.8}$$

$$x = \frac{-1.4 + \sqrt{44.08}}{-7.8} \text{ or } \frac{-1.4 - \sqrt{44.08}}{-7.8}$$

$$x = \frac{1.4 - \sqrt{44.08}}{7.8} \text{ or } \frac{1.4 + \sqrt{44.08}}{7.8}$$

OR
 move negative
 to numerator

p. 427 cont.

4. c) $6x - 3 = 2x^2$
 $0 = 2x^2 - 6x + 3$

$a = 2$

$b = -6$

$c = 3$

$$x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(3)}}{2(2)}$$

$$x = \frac{6 \pm \sqrt{36 - 24}}{4}$$

$$x = \frac{6 \pm \sqrt{12}}{4}$$

← reduce $\sqrt{12} = \sqrt{4 \cdot 3} = 2\sqrt{3}$

$$x = \frac{6 \pm 2\sqrt{3}}{4}$$

$$x = \frac{2(3 \pm \sqrt{3})}{4}$$

$$x = \frac{3 \pm \sqrt{3}}{2}$$

$$x = \frac{3 + \sqrt{3}}{2} \text{ or } \frac{3 - \sqrt{3}}{2}$$

d) $x^2 + 1 = x$
 $x^2 - x + 1 = 0$

$a = 1$

$b = -1$

$c = 1$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(1)}}{2(-1)}$$

$$x = \frac{1 \pm \sqrt{1 - 4}}{-2}$$

$$x = \frac{1 \pm \sqrt{-3}}{-2}$$

no solution

cannot take the square root of a negative number so there is no solution and no roots

p. 427 cont.

7. $p(c) = -25c^2 + 500c - 350$

a) breaking even means zero profit

$$0 = -25c^2 + 500c - 350$$

$$a = -25$$

$$b = 500$$

$$c = -350$$

$$p = \frac{-500 \pm \sqrt{500^2 - 4(-25)(-350)}}{2(-25)}$$

$$p = \frac{-500 \pm \sqrt{250000 - 35000}}{-50}$$

$$p = \frac{-500 \pm \sqrt{215000}}{-50}$$

$$p = \frac{-500 \pm 463.68}{-50}$$

$$p = \frac{-500 + 463.68}{-50} \quad \text{or} \quad \frac{-500 - 463.68}{-50}$$

$$p = \$0.73 \quad \quad \quad \$19.27$$

b) line of symmetry: $x = \frac{0.73 + 19.27}{2}$

$$x = \frac{20}{2}$$

$$x = 10 \leftarrow x\text{-value for vertex}$$

The ticket price at the vertex is \$10 so that will give the most profit.