

Practice:

$$1. \quad \begin{aligned} y &= x^2 - 2 \\ y &= -2x^2 + 6x + 7 \end{aligned}$$

$$x^2 - 2 = -2x^2 + 6x + 7$$

$$3x^2 - 6x - 9 = 0$$

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

$$(x-3)(x+1) = 0$$

$$x = 3, \quad x = -1$$

$$y = 7, \quad y = -1$$

$$\text{Solution } \{ (3, 7), (-1, -1) \}$$

$$2. \quad \begin{aligned} y &= x^2 \\ y &= -x^2 + 8x - 16 \end{aligned}$$

$$x^2 = -x^2 + 8x - 16$$

$$2x^2 - 8x + 16 = 0$$

$$x^2 - 4x + 8 = 0$$

$$\begin{aligned} x &= \frac{4 \pm \sqrt{16 - 4(1)(8)}}{2} \\ &= \frac{4 \pm \sqrt{-16}}{2} \end{aligned}$$

$$\text{Solution } \{ \dots \}$$

3. Solve by graphing. You may use a graphing calculator.

$$-3(x - 1.5)^2 + 2.25 = 2x(x + 1.5)$$

$$f(x) = -3(x - 1.5)^2 + 2.25$$

$$g(x) = 2x(x + 1.5)$$

$$x = 0$$

MORE CHALLENGING AND MORE INTERESTING:

4. $9x^2 + 32y^2 = 324$
 $3x^2 - y^2 = 3$

$\rightarrow -9x^2 + 3y^2 = -9$
 $9x^2 + 32y^2 = 324$

 $35y^2 = 315$
 $y^2 = 9$
 $y = \pm 3$

$y = 3$

 $3x^2 - 9 = 3$
 $3x^2 = 12$
 $x^2 = 4$
 $x = \pm 2$
 \downarrow
 $(2, 3)$
 $(-2, 3)$

$y = -3$

 $3x^2 - 9 = 3$
 \downarrow
 $x = \pm 2$
 \downarrow
 $(2, -3)$
 $(-2, -3)$

Solutions $\{(2, 3), (-2, 3), (2, -3), (-2, -3)\}$

5. $7x^2 - 5y^2 + 20y = 3$
 $21x^2 + 5y^2 = 209$

$\rightarrow 21x^2 = 209 - 5y^2$
 $x^2 = \frac{1}{21}(209 - 5y^2)$

$\rightarrow 7x^2 - 5y^2 + 20y = 3$
 $7\left(\frac{1}{21}(209 - 5y^2)\right) - 5y^2 + 20y = 3$
 $209 - 5y^2 - 15y^2 + 60y = 9$
 $-20y^2 + 60y + 200 = 0$
 $y^2 - 3y - 10 = 0$
 $(y-5)(y+2) = 0$
 $y = 5 \quad y = -2$

$y = 5$

 $21x^2 + 125 = 209$
 $x^2 = 4$
 $x = \pm 2$

$y = -2$

 $21x^2 + 20 = 209$
 $x^2 = 9$
 $x = \pm 3$

$S = \{(2, 5), (-2, 5), (3, -2), (-3, -2)\}$