

Find the zeros of each function by using the Quadratic Formula.

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

1. $f(x) = x^2 + 8x - 3$
 $a=1$ $b=8$ $c=-3$

$$X = \frac{-8 \pm \sqrt{64 - 4(1)(-3)}}{2(1)}$$

$$X = \frac{-8 \pm \sqrt{76}}{2} = \frac{-8 \pm 2\sqrt{19}}{2}$$

$$= \boxed{-4 \pm \sqrt{19}}$$

3. $h(x) = x^2 - x + 12$
 $a=1$ $b=-1$ $c=12$

$$X = \frac{1 \pm \sqrt{1 - 4(1)(12)}}{2(1)}$$

$$X = \frac{1 \pm \sqrt{-47}}{2} = \boxed{\frac{1 \pm i\sqrt{47}}{2}}$$

5. $f(x) = -2x^2 + 6x - 2$
 $a=-2$ $b=6$ $c=-2$

$$X = \frac{-6 \pm \sqrt{36 - 4(-2)(-2)}}{2(-2)}$$

$$X = \frac{-6 \pm \sqrt{20}}{-4} = \frac{-6 \pm 2\sqrt{5}}{-4}$$

$$= \boxed{\frac{3 \pm \sqrt{5}}{2}}$$

2. $g(x) = 2x^2 - 6x - 1$
 $a=2$ $b=-6$ $c=-1$

$$X = \frac{6 \pm \sqrt{36 - 4(2)(-1)}}{2(2)}$$

$$X = \frac{6 \pm \sqrt{44}}{4} = \frac{6 \pm 2\sqrt{11}}{4}$$

$$= \boxed{\frac{3 \pm \sqrt{11}}{2}}$$

4. $f(x) = -2x^2 - 5x + 20$
 $a=-2$ $b=-5$ $c=20$

$$X = \frac{5 \pm \sqrt{25 - 4(-2)(20)}}{2(-2)}$$

$$X = \boxed{\frac{5 \pm \sqrt{185}}{-4}}$$

6. $f(x) = 3x^2 - 10x + 4$
 $a=3$ $b=-10$ $c=4$

$$X = \frac{10 \pm \sqrt{100 - 4(3)(4)}}{2(3)}$$

$$X = \frac{10 \pm \sqrt{52}}{6} = \frac{10 \pm 2\sqrt{13}}{6}$$

$$= \boxed{\frac{5 \pm \sqrt{13}}{3}}$$

Find the discriminant and tell what type and number of solutions for each equation.

7. $2x^2 + 7 = -4x$
 $2x^2 + 4x + 7 = 0$
 $a=2$ $b=4$ $c=7$

$$16 - 4(2)(7) = -40 < 0$$

2 Imag.

8. $x^2 - 3 = -6x$
 $x^2 + 6x - 3 = 0$
 $a=1$ $b=6$ $c=-3$

$$36 - 4(1)(-3) = 48 > 0$$

2 Real

9. $4x^2 + 4 = -8x$
 $4x^2 + 8x + 4 = 0$
 $a=4$ $b=8$ $c=4$

$$64 - 4(4)(4) = 0 = 0$$

1 Real

Review 16.2: Completing the Square

Complete the square for each expression. Write the resulting expression as a binomial squared (Factor).

$$1. x^2 - 4x + \frac{4}{1} = (x - 2)^2$$

\downarrow
 $(\frac{4}{2})^2$

$$2. x^2 + 12x + \frac{36}{1} = (x + 6)^2$$

\downarrow
 $(\frac{12}{2})^2$

Solve each equation by completing the square.

$$3. d^2 = 8 + 5d$$

$$d^2 - 5d + \frac{25}{4} = 8 + \frac{25}{4}$$

$$(x - \frac{5}{2})^2 = \frac{57}{4}$$

$$x - \frac{5}{2} = \pm \sqrt{\frac{57}{4}}$$

$$x = \frac{5}{2} \pm \sqrt{\frac{57}{4}}$$

$$4. x^2 + 2x = 3$$

$$x^2 + 2x + \frac{1}{1} = 3 + \frac{1}{1}$$

$$(x + 1)^2 = 4$$

$$x + 1 = \pm 2$$

$$x = -1 \pm 2$$

$$x = 1 \text{ or } x = -3$$

$$5. 18x = 3x^2 - 30$$

$$30 = 3x^2 - 18x$$

$$30 + 3(\frac{9}{1}) = 3(x^2 - 6x + \frac{9}{1})$$

$$57 = 3(x - 3)^2$$

$$19 = (x - 3)^2$$

$$\pm \sqrt{19} = x - 3$$

$$3 \pm \sqrt{19} = x$$

$$6. 4x^2 = -12x + 4$$

$$4x^2 + 12x = 4$$

$$4(x^2 + 3x + \frac{9}{4}) = 4 + 4(\frac{9}{4})$$

$$4(x + \frac{3}{2})^2 = 13$$

$$(x + \frac{3}{2})^2 = \frac{13}{4}$$

$$x + \frac{3}{2} = \pm \sqrt{\frac{13}{4}}$$

$$x = -\frac{3}{2} \pm \sqrt{\frac{13}{4}}$$

Write each function in vertex form, and identify its vertex.

$$7. f(x) = x^2 - 6x - 2$$

$$f(x) + 2 + \frac{9}{1} = x^2 - 6x + \frac{9}{1}$$

$$f(x) + 11 = (x - 3)^2$$

$$f(x) = (x - 3)^2 - 11$$

opp keep
 $V(3, -11)$

$$8. g(x) = x^2 - 4x + 1$$

$$g(x) - 1 + \frac{4}{1} = x^2 - 4x + \frac{4}{1}$$

$$g(x) + 3 = (x - 2)^2$$

$$g(x) = (x - 2)^2 - 3$$

opp keep
 $V(2, -3)$