

47.  $f(x) = x^2 + 2x - 15$  Determine the vertex if the axis of symmetry is  $x = -1$ .

$$f(-1) = (-1)^2 + 2(-1) - 15 = 1 - 2 - 15 = -16$$

Vertex:  $(-1, -16)$

48. Determine the axis of symmetry of each parabola if the  $x$ -intercepts of a parabola are  $(3, 0)$  and  $(9, 0)$ .

$$x = \frac{3+9}{2} = \frac{12}{2} = 6 \quad \text{Axis of symmetry: } x = 6$$

Identify the form of each quadratic function as either standard form, factored form, or vertex form. Then state all you know about the quadratic function's key characteristics, based only on the given equation of the function.

49.  $f(x) = -(x-8)(x-4)$   $\curvearrowright$  down,  $x$ -intercepts:  $(8, 0), (4, 0)$   
Factored form

50.  $f(x) = 2x^2 - 1$   $\curvearrowleft$  up,  $y$ -intercept:  $(0, -1)$   
standard form

51.  $f(x) = 5(x-3)^2 + 12$   $\curvearrowleft$  up, stretched by 5 units, vertex:  $(3, 12)$   
Vertex form

Determine the vertex of each quadratic function given in vertex form.

52.  $f(x) = \frac{1}{2}(x-2)^2 + 6$  Vertex:  $(2, 6)$

Determine whether each expression is a polynomial. If the expression is not a polynomial, explain why it is not.

53.  $-2w^3 + w^2 - 5$  yes

54.  $6m^{\frac{1}{2}}$  no, the exponent cannot be a fraction.

Write each polynomial in standard form. Classify the polynomial by its number of terms and by its degree.

55.  $x^3 - x^2 - x^5$   $-x^5 + x^3 - x^2$   
3 terms = trinomial

degree: 5 (highest exponent)

Simplify each expression.

56.  $(5x - 8) + (7x + 10)$   
 $5x + 7x - 8 + 10$   
 $12x + 2$

58.  $(-x^2 + 5x - 12) + (2x^2 - 6)$   
 $-x^2 + 2x^2 + 5x - 12 - 6$   
 $x^2 + 5x - 18$

60.  $(-7m^3 - m^2 - m) - (-10m^3 - m - 1)$   
 $-7m^3 + 10m^3 - m^2 - m + m + 1 = 3m^3 - m^2 + 1$

57.  $(4m^2 + 9m) \ominus (2m^2 + 6)$   
 $4m^2 - 2m^2 + 9m - 6$   
 $2m^2 + 9m - 6$

59.  $(10t^2 - 3t + 9) \ominus (6t^2 - 7t)$   
 $10t^2 - 6t^2 - 3t + 7t + 9$   
 $4t^2 + 4t + 9$

Identify the terms and coefficients in each expression.

61.  $-3w^4 + w^2 - 9$   
Terms:  $-3w^4, w^2, -9$   
Coefficients:  $-3, 1, -9$   $\leftarrow$  Also a constant.

Determine the product of the polynomials using the Distributive Property.

62.  $3x(x^2 + 5x - 1)$   
 $3x^3 + 15x^2 - 3x$

63.  $(x+2)(x^2 + 6x - 1)$   
 $x^3 + 6x^2 - x + 2x^2 + 12x - 2$   
 $x^3 + 8x^2 + 11x - 2$

Determine the product of the polynomials using the Distributive Property.

$$64. \overbrace{2x(x+6)} \\ 2x^2 + 12x$$

$$65. \overbrace{(2x+1)(x+8)} = 2x^2 + 17x + 8$$

Factor each of the following completely. If possible, factor out the greatest common factor first.

$$66. x^2 - 9x + 18 \\ \underline{-3}, \underline{-6} = 18 \\ \underline{-3} + \underline{-6} = -9$$

$$67. \frac{4w^2}{4} + \frac{12w}{4} - \frac{40}{4} = w^2 + 3w - 10 \\ \underline{5}, \underline{-2} = -10 \\ \underline{5} + \underline{-2} = 3$$

$$68. \frac{3m^3}{3m} + \frac{36m^2}{3m} + \frac{60m}{3m} = m^2 + 12m + 20 \\ \underline{2} \cdot \underline{10} = 20 \\ \underline{2} + \underline{10} = 12$$

$$69. (x-3)(x-6)$$

$$4(w+5)(w-2)$$

$$3m(m+2)(m+10)$$

$$70. x^2 - 2x - 8 \\ \underline{2}, \underline{-4} = -8 \\ \underline{2} + \underline{-4} = -2$$

$$71. x^2 + 4x - 12 \\ \underline{-2}, \underline{6} = -12 \\ \underline{-2} + \underline{6} = 4$$

$$72. x^2 + 4x + 4 \\ \text{perfect square trinomial} \\ (x+2)^2$$

$$73. (x+2)(x-4)$$

$$74. x^2 - 10x + 25 \\ \text{perfect square trinomial} \\ (x-5)^2$$

$$75. \frac{5x^2}{5} + \frac{10x}{5} - \frac{15}{5} = x^2 + 2x - 3 \\ \underline{-1}, \underline{3} = -3 \\ \underline{-1} + \underline{3} = 2$$

Factor and solve each quadratic equation. Check your answer.

$$76. \frac{x^2}{x} + \frac{8x}{x} = 0 \quad x=0, \quad x+8=0 \\ x(x+8)=0 \quad x=-8 \\ (0,0), (-8,0)$$

$$77. x^2 + t - 3 = 0 \quad t^2 + t(2t+3)(t-1) = 0 \\ t^2 + t - 6 = 0 \quad 2t+3=0, \quad t-1=0 \\ (t+3)(t-2) = 0 \quad t = -\frac{3}{2}, \quad t = 1$$

$$78. x^2 + 5x + 6 = 0 \quad x+3=0, \quad x+2=0 \\ (x+3)(x+2) = 0 \quad x = -3, \quad x = -2 \\ (-3,0), (-2,0)$$

$$79. x^2 - 3x - 4 = 0 \quad (-\frac{3}{2}, 0), (1, 0) \\ (x-4)(x+1) = 0 \\ x = 4, \quad x = -1 \\ (4,0), (-1,0)$$

Simplify each square root (no decimal answers)

$$80. \sqrt{45} = \pm \sqrt{9 \cdot 5} \\ \pm 3\sqrt{5}$$

$$81. \sqrt{12} = \pm \sqrt{4 \cdot 3} \\ \pm 2\sqrt{3}$$

$$82. \sqrt{32} = \pm \sqrt{16 \cdot 2} \\ \pm 4\sqrt{2}$$

Solve each quadratic equation. Write radical answers in reduced radical form.

$$83. x^2 = 40 \\ \sqrt{x^2} = \pm \sqrt{40} \\ x = \pm \sqrt{4 \cdot 10} \\ x = \pm 2\sqrt{10}$$

$$84. (x-5)^2 = 22 \\ \sqrt{(x-5)^2} = \pm \sqrt{22} \\ x-5 = \pm \sqrt{22} \\ \underline{+5} \quad \underline{+5} \\ x = 5 \pm \sqrt{22}$$

$$85. x^2 = 27 \\ \sqrt{x^2} = \pm \sqrt{27} \\ x = \pm \sqrt{9 \cdot 3} \\ x = \pm 3\sqrt{3}$$

Determine the unknown value that would make each trinomial a perfect square.

$$86. x^2 - 10x + \underline{25} \\ (\frac{-10}{2})^2 = (-5)^2 = 25$$

$$87. x^2 - \underline{18}x + 81 \\ (\frac{?}{2})^2 = 81 \\ \sqrt{(\frac{?}{2})^2} = \sqrt{81}$$

$$\frac{?}{2} = 9 \\ 2(\frac{?}{2}) = 9 \cdot 2 \\ ? = 18$$