Learning Goals:
To find the solutions to quadratic equations using factoring.
To graph the solutions to a quadratic equation.

Notes

Zero Product Property states <u>if the product of 2 or more factors = 0, then at least 1 of the factors = 0.</u>

If $ab = 0$, then $a = 0$ or $b = 0$.

PROBLEM 1 – "Roots of Quadratic Equations" (Page 744)

1. Use the Zero Product Property to determine the solutions of the quadratic equation $x^2 – 4x – 5 = 0$.
    Then, check your solutions by substituting back into the original equation.

    Factor the quadratic equation. $x^2 – 4x – 5 = (x – 5)(x + 1) = 0$

    Set each binomial factor = 0. $x – 5 = 0$ $x + 1 = 0$

    Solve for the variable (x). $x = 5$ $x = -1$

    Check: $5^2 – 4(5) – 5 = 25 – 20 – 5 = 0$ ✓

                                            $(-1)^2 – 4(-1) – 5 = 1 + 4 – 5 = 0$ ✓

2. Let's examine the quadratic equation $0 = x^2 – 4x – 5$. (Page 745)

    a. Graph both sides of the quadratic equation on the coordinate plane shown.

    b. SKIP

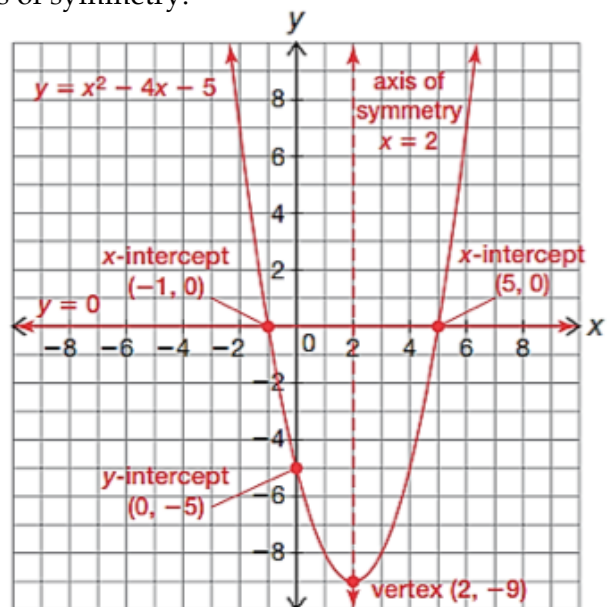   c. Identify the vertex, x- and y-intercepts, and the axis of symmetry.

    y-intercept: (0, -5)
    Let $x = 0$ and solve for y.

    x-intercept(s): (-1, 0) and (5, 0)
    The x-intercepts are the solutions to the
    quadratic equation.

    axis of symmetry: $x = 2$
    $$x = \frac{-1+5}{2} = \frac{4}{2} = 2$$

    vertex: (2, -9)
    Let $x = 2$ and solve for y.

*The <u>x-intercepts</u> are the solutions to the quadratic equation, a.k.a the <u>zeros</u> because you set the
quadratic equation equal to zero and solve for x. The x-intercepts also indicate where the graph
crosses the x-axis and are also referred to as the <u>roots</u>.*

Determine the roots of each quadratic equation. (Page 746)

3. $x^2 - 8x + 12 = 0$

   $x^2 - 8x + 12 = 0$

   $(x - 6)(x - 2) = 0$

   $x - 6 = 0$ or $x - 2 = 0$

   $x = 6$ $x = 2$

   Check: $(6)^2 - 8(6) + 12 = 36 - 48 + 12 = 0$

   $(2)^2 - 8(2) + 12 = 4 - 16 + 12 = 0$

4. $x^2 - 5x - 24 = 0$

   $x^2 - 5x - 24 = 0$

   $(x - 8)(x + 3) = 0$

   $x - 8 = 0$ or $x + 3 = 0$

   $x = 8$ $x = -3$

   Check: $(8)^2 - 5(8) - 24 = 64 - 40 - 24 = 0$

   $(-3)^2 - 5(-3) - 24 = 9 + 15 - 24 = 0$

5. SKIP

6. SKIP

7. $x^2 + 8x = -7$

   $x^2 + 8x = -7$

   $x^2 + 8x + 7 = -7 + 7$

   $x^2 + 8x + 7 = 0$

   $(x + 7)(x + 1) = 0$

   $x + 7 = 0$ or $x + 1 = 0$

   $x = -7$ or $x = -1$

   Check: $x^2 + 8x = (-7)^2 + 8(-7) = 49 - 56 = -7$

   $x^2 + 8x = (-1)^2 + 8(-1) = 1 - 8 = -7$

8. $x^2 - 5x = 13x - 81$

   $x^2 - 5x = 13x - 81$

   $x^2 - 5x - 13x + 81 = 13x - 81 - 13x + 81$

   $x^2 - 18x + 81 = 0$

   $(x - 9)(x - 9) = 0$

   $x - 9 = 0$ or $x - 9 = 0$

   $x = 9$ or $x = 9$

   Check: $x^2 - 5x = 13x - 81$

   $(9)^2 - 5(9) = 13(9) - 81$

   $81 - 45 = 117 - 81$

   $36 = 36$

9. $3x^2 - 22x + 7 = 0$

$x^2 - 22x + 21 = 0$

$(x - 21)(x - 1) = 0$

$$\left(x - \frac{21}{3}\right)\left(x - \frac{1}{3}\right)$$

$x - 7 = 0$ or $x - \dfrac{1}{3} = 0$

$x = 7$ or $x = \dfrac{1}{3}$

10. SKIP

PROBLEM 2 – "More Practice" (Page 749)

Calculate the zeros of each quadratic function, or the roots of each quadratic equation, if possible.

1. SKIP

2. $f(x) = x^2 - 11x + 12$

No real zeros.

3. SKIP

4. $2x^2 + 4x = 0$

$2x^2 + 4x = 0$

$2x(x + 2) = 0$

$2x = 0$ or $x + 2 = 0$

$x = 0$ or $x = -2$

Check: $2(0)^2 + 4(0) = 0$

$2(-2)^2 + 4(-2) = 8 - 8 = 0$

5. $\dfrac{2}{3}x^2 - \dfrac{5}{6}x = 0$

$\dfrac{2}{3}x^2 - \dfrac{5}{6}x = 0$

$6\left(\dfrac{2}{3}x^2 - \dfrac{5}{6}x = 0\right)$

$4x^2 - 5x = 0$

$x(4x - 5) = 0$

$x = 0$ or $4x - 5 = 0$

$x = 0$ or $x = \dfrac{5}{4}$