Multiply each of the following. Show all steps.

1. \((1 + i)^2\)
   \[= \ (1 + i) \cdot (1 + i) \]
   \[= \ 1 \cdot (1 + i) + i \cdot (1 + i) \]
   \[= \ 1 + i + i + i^2 \]
   \[= \ 1 + 2i + i^2 \]
   \[= \ 1 + 2i - 1 \]
   \[= \ 2i \]

2. \((r - 2)(r + 2)\)
   \[= \ r \cdot (r+2) - 2 \cdot (r + 2) \]
   \[= \ r^2 + 2r - 2r - 4 \]
   \[= \ r^2 - 4 \]

3. \((t - 5)^2\)
   \[= \ (t - 5) \cdot (t - 5) \]
   \[= \ t \cdot (t-5) - 5 \cdot (t-5) \]
   \[= \ t^2 - 5t - 5t + 25 \]
   \[= \ t^2 - 10t + 25 \]
4. \((4x - 5)(4x + 5) = 4x(4x + 5) - 5(4x + 5)\)

\[= 16x^2 + 20x - 20x - 25\]

\[= 16x^2 - 25\]

SECTION 6.4: Special Polynomial Products (p. 466 – 474)

- Perfect Square Trinomial (p. 466)
- To Recognize a Perfect Square Trinomial (p. 466)
- Factoring Perfect Square Trinomials (p. 467)
- To Recognize the Difference of Squares (p. 468)
- Factoring a Difference of Squares (p. 468)
- Connecting the Concepts: Algebraic and Graphical Methods (p. 472)

Solve each of the following. Show all steps.

5. \(t^2 + 18t = -8i\)

\[\Rightarrow t^2 + 18t + 81 = 0\]

\[a = 1, \ b = 18, \ c = 81\]

\[\Rightarrow t^2 + 9t + 9t + 81 = 0\]

\[\Rightarrow t(t + 9) + 9(t + 9) = 0\]

\[\Rightarrow (t + 9)(t + 9) = 0\]

\[\Rightarrow t + 9 = 0 \quad \Rightarrow \quad t = -9\]

6. \(x^2 = 25\)

\[\Rightarrow x^2 - 25 = 0\]

\[a = 1, \ b = 0, \ c = -25\]

\[\Rightarrow x^2 - 5x + 5x - 25 = 0\]

\[\Rightarrow (x - 5) + 5(x - 5) = 0\]

\[\Rightarrow (x + 5)(x - 5) = 0\]

\[\Rightarrow x + 5 = 0 \quad \text{or} \quad x - 5 = 0\]

\[\Rightarrow x = -5 \quad \text{or} \quad x = 5\]
7. \[ a^2 + 64 = 16a \]
    \[ \Rightarrow a^2 - 16a + 64 = 0 \]
    \[ a = 1, \ b = -16, \ c = 64 \]
    \[ \Rightarrow a^2 - 8a - 8a + 64 = 0 \]
    \[ \Rightarrow a \cdot (a - 8) - 8 \cdot (a - 8) = 0 \]
    \[ \Rightarrow (a - 8) \cdot (a - 8) = 0 \]
    \[ \Rightarrow a - 8 = 0 \quad \Rightarrow \quad a = 8 \]

8. \[ 25y^2 - 64 = 0 \]
    \[ \Rightarrow (5y)^2 - (8)^2 = 0 \]
    \[ \Rightarrow (5y - 8) \cdot (5y + 8) = 0 \]
    \[ \Rightarrow 5y - 8 = 0 \quad \text{or} \quad 5y + 8 = 0 \]
    \[ \Rightarrow 5y = 8 \quad \text{or} \quad 5y = -8 \]
    \[ \Rightarrow y = 8/5 \quad \text{or} \quad y = -8/5 \]

9. \[ 2b^2 - b = 21 \]
    \[ a = 2, \ b = -1, \ c = -21 \]
    \[ \Rightarrow 2b^2 - b - 21 = 0 \]
    \[ \Rightarrow 2b^2 + 6b - 7b - 21 = 0 \]
    \[ \Rightarrow 2b \cdot (b+3) - 7 \cdot (b+3) = 0 \]
    \[ \Rightarrow (2b - 7) \cdot (b+3) = 0 \]
    \[ \Rightarrow 2b - 7 = 0 \quad \text{or} \quad b + 3 = 0 \]
    \[ \Rightarrow b = 7/2 \quad \text{or} \quad b = -3 \]
9. Consider the equation \( x^2 - x - 6 = x - 3 \).

Solve this equation using two different methods:

A. An algebraic technique.

\[
\begin{align*}
    x^2 - x - 6 &= x - 3 \\
    \Rightarrow x^2 - 2x - 3 &= 0 \\
    a=1, \ b=-2, \ c=-3 \\
    \Rightarrow x^2 - 3x + x - 3 &= 0 \\
    \Rightarrow x \cdot (x-3) + 1 \cdot (x-3) &= 0
\end{align*}
\]

\[
\begin{align*}
    (x+1) \cdot (x-3) &= 0 \\
    \Rightarrow x+1 = 0 \text{ or } x-3 = 0 \\
    \Rightarrow x = -1 \text{ or } x = 3
\end{align*}
\]

B. A graphical technique

We begin by identifying the functions on the left and right hand sides.

\[
\begin{align*}
    y_1 &= x^2 - x - 6 \\
    y_2 &= x - 3
\end{align*}
\]

Now, we graph these functions.

![Graph showing two intersecting curves with points of intersection at (-1, -4) and (3, 0).]

Left point of intersection: \((-1, -4)\) \(\Rightarrow x = -1\)

Right point of intersection \((3, 0)\) \(\Rightarrow x = 3\)