

$$\begin{array}{r} 32 \\ \hline 21 \overline{) 672} \\ \underline{-63} \downarrow \\ 42 \\ \underline{-42} \\ 0 \end{array}$$

Steps for Polynomial Long Division

1. Set up long division.
2. Divide. (first term into first term ONLY)
3. Multiply.
4. Subtract.
5. Bring down. Repeat

Example 1: Use long division to divide $4x^2 + 23x - 16$ by $x + 5$. What is the quotient and remainder?

$$\begin{array}{r} \text{Quotient: } 4x + 3 \\ x + 5 \overline{) 4x^2 + 23x - 16} \\ \underline{- 4x^2 + 20x} \downarrow \\ 3x - 16 \\ \underline{+ 3x + 15} \\ -31 \end{array}$$

Remainder

Quotient: $4x + 3$ $\frac{-31}{x+5}$
($x+5$ is not a factor.)

When a power of x is "missing" when written in standard form, use a 0 as a placeholder.

Example 2: Use long division to divide $x^2 + 3$ by $x - 1$. What is the quotient and remainder?

$$\begin{array}{r} x+1 \\ x-1 \overline{) x^2+0x+3} \\ \underline{+(x^2+1x)} \downarrow \\ \phantom{x-1 \overline{) }} x+3 \\ \phantom{x-1 \overline{) }} \underline{+(-x+1)} \\ \phantom{x-1 \overline{) }} 4 \end{array}$$

Quotient: $x+1 + \frac{4}{x-1}$ \rightarrow Remainder
($x-1$ is not a factor.)