

# Precalculus

## Division of a polynomial by a linear polynomial

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## Example (Polynomial long division)

Divide with quotient and remainder  $x^3 + 2x^2 + 1$  by  $x - 1$ .

$$\begin{array}{r}
 \text{Quotient:} \quad x^2 + 3x + 3 \\
 x - 1 \overline{) x^3 + 2x^2 + 1} \\
 \underline{-} \phantom{+ 1} x^3 - x^2 \phantom{+ 1} \\
 \phantom{x - 1 \overline{) }} 3x^2 + 1 \\
 \underline{-} \phantom{x - 1 \overline{) }} 3x^2 - 3x \phantom{+ 1} \\
 \phantom{x - 1 \overline{) }} 3x + 1 \\
 \underline{-} \phantom{x - 1 \overline{) }} 3x - 3 \\
 \phantom{x - 1 \overline{) }} 4
 \end{array}$$

**Remainder:** 4

$$\begin{aligned}
 (\text{Dividend}) &= (\text{Quotient}) \cdot (\text{Divisor}) + (\text{Remainder}) \\
 (x^3 + 2x^2 + 1) &= (x^2 + 3x + 3) \cdot (x - 1) + 4
 \end{aligned}$$