

Polynomial Long Division

Review:

$$\text{divisor} \overline{) \text{dividend}}^{\text{quotient}}$$

$$\boxed{\text{dividend} = (\text{divisor})(\text{quotient}) + \text{remainder}}$$

$$\begin{array}{r} 72 \\ 8 \overline{) 579} \\ \underline{56} \\ 19 \\ \underline{16} \\ 3 \end{array}$$

→ remainder = 3 < 8 (divisor)

$$\boxed{579 = (8)(72) + 3} \leftarrow \text{division statement}$$

$$\frac{579}{8} = 72 + \frac{3}{8}$$

Ex 1: (Polynomials) We can divide a polynomial by a polynomial of lesser degree.

Divide $(3x^3 - 5x^2 - 7x - 1) \div (x - 3)$

$$\begin{array}{r} 3x^2 + 4x + 5 \\ x-3 \overline{) 3x^3 - 5x^2 - 7x - 1} \\ \underline{3x^3 - 9x^2} \\ 4x^2 - 7x \\ \underline{4x^2 - 12x} \\ 5x - 1 \\ \underline{5x - 15} \\ 14 \end{array}$$

14 ← remainder has degree less than that of the divisor.

$$3x^3 - 5x^2 - 7x - 1 = (x - 3)(3x^2 + 4x + 5) + 14 \checkmark$$

$$\frac{3x^3 - 5x^2 - 7x - 1}{x - 3} = 3x^2 + 4x + 5 + \frac{14}{x - 3} \leftarrow$$