

### 2.3 Polynomials and Synthetic Division

- Use long division to divide a polynomial by a polynomial
- Use synthetic division to divide polynomials by a binomial
- Use the Remainder Theorem and Factor Theorem

Review of long division algorithm:

$$\begin{array}{r} \underline{7852} \\ 34 \end{array}$$

Polynomial division:

$$\frac{4x^3 - 8x^2 + x - 2}{2x - 1}$$

If the remainder is zero, what does that mean?

Synthetic division - a shortcut

$$\frac{3x^3+5x^2-3x+27}{x+3}$$

$$\frac{x^3+1}{x+1}$$

$$\frac{P(x)}{(x-r)}$$

If the remainder is zero, then  $x-r$  is a factor of  $P(x)$  and  $P(r) = 0$ .

$$P(r)$$

$$P(x) = 3x^3+4x^2+8$$

$$P(1)$$

Divide by  $(x-1)$

$$P(-4)$$

Divide by  $(x+4)$

$$P(-2) =$$

Divide by  $x+2$