

6-5 Polynomial Division / Synthetic Division

Alg2 std. 3.0

Polynomial (Long) Division

ex. 1

$$\begin{array}{r}
 \text{dividend} \quad \text{divisor} \\
 (2x^3 + 9x^2 - 13x + 30) \div (x + 6) \\
 \hline
 2x^2 - 3x + 5 \leftarrow \text{quotient} \\
 \begin{array}{r}
 x+6 \overline{) 2x^3 + 9x^2 - 13x + 30} \\
 \underline{-(2x^3 + 12x^2)} \phantom{+ 30} \\
 -3x^2 - 13x \phantom{+ 30} \\
 \underline{-(-3x^2 - 18x)} \phantom{+ 30} \\
 5x + 30 \\
 \underline{-(5x + 30)} \\
 0
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 182 \overline{) 2913} \\
 \underline{-16} \\
 131 \\
 \underline{-128} \\
 33 \\
 \underline{32} \\
 1
 \end{array}$$

ex. 2

$$\begin{array}{r}
 (y^4 + 2y^2 - y + 1) \div (y^2 - y + 1) \\
 \hline
 y^2 + y + 2 - \frac{1}{y^2 - y + 1} \\
 \begin{array}{r}
 y^2 - y + 1 \overline{) y^4 + 0y^3 + 2y^2 - y + 1} \\
 \underline{-(y^4 - y^3 + y^2)} \\
 y^3 + y^2 - y \\
 \underline{-(y^3 - y^2 + y)} \\
 2y^2 - 2y + 1 \\
 \underline{-(2y^2 - 2y + 2)} \\
 -1
 \end{array}
 \end{array}$$

# Synthetic Division

$$x - a$$

ex. 3

$$(2x^3 + 9x^2 - 13x + 30) \div (x + 6)$$

$x - (-6)$   
 $-6 \mid 2 \quad 9 \quad -13 \quad 30$   
 $\quad \quad \downarrow \quad \nearrow -12 \quad 18 \quad -30$   
 $\quad \quad \hline$ 
 $\quad \quad 2 \quad -3 \quad 5 \quad \mid 0 = \text{remainder}$

$2x^2 - 3x + 5$

ex. 4

$$(x^4 - 6x^3 - 40x + 33) \div (x - 7)$$

$x - 7$   
 $7 \mid 1 \quad -6 \quad 0 \quad -40 \quad 33$   
 $\quad \quad \downarrow \quad \nearrow 7 \quad 7 \quad 49 \quad 63$   
 $\quad \quad \hline$ 
 $\quad \quad 1 \quad 1 \quad 7 \quad 9 \quad \mid 96$

$x^3 + x^2 + 7x + 9 + \frac{96}{x-7}$