

Chapter 2 Section 3

Synthetic Division

$$\begin{array}{r} \text{2 R 4} \\ 17 \overline{) 361} \\ -34 \\ \hline 21 \\ -17 \\ \hline 4 \end{array}$$

LONG DIVISION

• 1. $x - 2 \overline{)4x^2 - 3x + 8}$

$$\begin{array}{r}
 4(x^2) \\
 + (4x^2 + 8x) \\
 \hline
 5x + 8 \\
 + (-5x + 10) \\
 \hline
 18
 \end{array}$$

2. $x + 4 \overline{)6x^2 + 8x - 12}$

$$\begin{array}{r}
 6x(x+4) \\
 + (6x^2 + 24x) \\
 \hline
 6x - 12 \\
 - 16(x+4) \\
 + (+16x + 64) \\
 \hline
 52
 \end{array}$$

Synthetic Division

• 1. $x - 2 \overline{)4x^2 - 3x + 8}$

$$\begin{array}{r|rrrr} 2 & 4 & -3 & 2 \\ & & 8 & 16 \\ \hline & 4 & 5 & \boxed{18} \end{array}$$

$4x+5$ R 18

2. $x + 4 \overline{)6x^2 + 8x - 12}$

$$\begin{array}{r|rrr} -4 & 6 & 8 & -12 \\ & & -24 & 64 \\ \hline & 6 & -16 & \boxed{52} \end{array}$$

$(x-16)$ R 52

SD- continued

- 3. $5x^3 + 8x^2 - x + 6 \div x + 2$
- 4. $x^4 - 10x^2 - 2 \div x + 3$

$$\begin{array}{r} 5 \ 8 \ -1 \ 6 \\ \times \quad -2 \\ \hline 10 \ 4 \ -6 \\ \hline 5 \ -2 \ 3 \ 0 \end{array}$$

$5x^3 - 2x + 3$

$$\begin{array}{r} 1 \ 0 \ -10 \ 0 \ -2 \\ \times \quad -3 \\ \hline -3 \ 9 \ 3 \ -9 \\ \hline -3 \ -1 \ 3 \ \boxed{-11} \end{array}$$

$$x^3 - 3x^2 - x + 3 R -11$$

$$x^3 - 3x^2 - x + 3 - \frac{11}{x+3}$$

SD- continued

- 5. $x^2 + 3x + 5 \div x - 1$
- 6. $2x^3 - 4x^2 - 5x + 8 \div 3x + 6$

$$\begin{array}{r} 3 \quad 5 \\ | \quad | \\ 1 \quad 4 \\ \hline 4 \quad 9 \\ x+4 \quad R 9 \end{array}$$

Two Theorems

- **REMAINDER THEOREM:**
 - If a polynomial function is divided by $(x - k)$, then the remainder is $r = f(k)$
- **FACTOR THEOREM:**
 - A polynomial function has a factor $(x - k)$ if and only if $f(k) = 0$