

Dividing Polynomials

a. Divide $x^3 - 27$ by $x + 3$

Long Division

$$\begin{array}{r}
 x^2 - 3x + 9 \quad r \quad \frac{-54}{x+3} \\
 x+3 \overline{) x^3 + 0x^2 + 0x - 27} \\
 \underline{x^3 + 3x^2} \\
 -3x^2 + 0x \\
 \underline{-3x^2 - 9x} \\
 +9x - 27 \\
 \underline{9x + 27} \\
 -54
 \end{array}$$

Synthetic Division

$$\begin{array}{r}
 -3 \overline{) 1 \ 0 \ 0 \ -27} \\
 \underline{1 \ -3 \ 9 \ -27} \\
 1 \ -3 \ 9 \ -54 \\
 \underline{1 \ -3 \ 9 \ -54} \\
 0 \ 0 \ 0 \ 0
 \end{array}$$

$x^2 - 3x + 9 \quad r \quad \frac{-54}{x+3}$

b. Divide $x^3 - 14x^2 + 51x - 54$ by $x - 2$

Long Division

$$\begin{array}{r}
 x^2 - 12x + 27 \\
 x-2 \overline{) x^3 - 14x^2 + 51x - 54} \\
 \underline{x^3 - 2x^2} \\
 -12x^2 + 51x \\
 \underline{-12x^2 + 24x} \\
 27x - 54 \\
 \underline{27x - 54} \\
 0
 \end{array}$$

Synthetic Division

$$\begin{array}{r}
 2 \overline{) 1 \ -14 \ 51 \ -54} \\
 + \quad 2 \quad -24 \quad 54 \\
 \hline
 1 \ -12 \ 27 \ 0
 \end{array}$$

$x^2 - 12x + 27$

c. Divide $2x^4 + 6x^3 + 5x^2 - 45$ by $x^2 - 3$

Long Division

$$\begin{array}{r}
 2x^2 + 6x + 11 \quad r \quad \frac{18x+12}{x^2-3} \\
 x^2-3 \overline{) 2x^4 + 6x^3 + 5x^2 + 0x - 45} \\
 \underline{2x^4 - 6x^2} \\
 6x^3 + 11x^2 + 0x \\
 \underline{6x^3 - 18x} \\
 11x^2 + 18x - 45 \\
 \underline{11x^2 - 33} \\
 18x + 12
 \end{array}$$

Synthetic Division

Can't Do