

3.4 Dividing Polynomials

$$\begin{array}{r} 191073 \\ 3 \overline{) 573221} \\ \underline{(-) 3} \\ 27 \\ \underline{(-) 27} \\ 03 \\ \underline{(-) 3} \\ 022 \\ \underline{(-) 21} \\ 11 \\ \underline{(-) 9} \\ 2 \end{array}$$

$$191073 \frac{2}{3}$$

Divide $P(x)$ by $D(x)$

$$p(x) = x^3 + 5x^2 + 6x + 9 \quad d(x) = x + 3$$

$$\begin{array}{r} x^2 + 2x \\ x+3 \overline{) x^3 + 5x^2 + 6x + 9} \\ \underline{(-) x^3 + 3x^2} \\ 2x^2 + 6x \\ \underline{(-) 2x^2 + 6x} \\ 0 + 9 \end{array}$$

$$x^2 + 2x + \frac{9}{x+3}$$

$$\begin{aligned}
 & (x+3)\left(x^2+2x+\frac{9}{x+3}\right) \\
 & \quad x^3+2x^2+\frac{9x}{x+3} \\
 & \quad \quad 3x^2+\frac{27}{x+3}+6x \\
 & \quad x^3+5x^2+6x+9
 \end{aligned}$$

$$\begin{aligned}
 \frac{9x+27}{x+3} &= \frac{9(x+3)}{\cancel{x+3}} \\
 &= 9
 \end{aligned}$$

Divide $P(x)$ by $D(x)$

$$p(x) = 2x^3 - 7x^2 - 4 \quad d(x) = x - 3$$

$$\begin{array}{r} \overline{2x^2 - x - 3} \\ x-3 \overline{) 2x^3 - 7x^2 + 0x - 4} \\ \underline{(-) 2x^3 - 6x^2} \\ -x^2 + 0x \\ \underline{(-) -x^2 + 3x} \\ -3x - 4 \\ \underline{(-) -3x + 9} \\ -13 \end{array}$$

$$2x^2 - x - 3 + \frac{-13}{x-3}$$

$$2x^2 - x - 3 - \frac{13}{x-3}$$

Divide $P(x)$ by $D(x)$

$$p(x) = x^4 - 16 \quad d(x) = x - 4$$

$$\begin{array}{r}
 x^3 + 4x^2 + 16x + 64 \\
 x-4 \overline{) x^4 + 0x^3 + 0x^2 + 0x - 16} \\
 \underline{(-) x^4 - 4x^3} \\
 4x^3 + 0x^2 \\
 \underline{(-) 4x^3 - 16x^2} \\
 16x^2 + 0x \\
 \underline{16x^2 - 64x} \\
 64x - 16 \\
 \underline{64x - 256} \\
 240
 \end{array}$$

$$x^3 + 4x^2 + 16x + 64 + \frac{240}{x-4}$$