

Lesson 2.3: Polynomial Long Division

Divide.

$$\begin{array}{r} \text{dividend} \quad 5349 \div \text{divisor } 7 \\ \hline 7 \overline{) 5349} \\ \underline{49} \\ 44 \\ \underline{42} \\ 29 \\ \underline{28} \\ \hline 1 \end{array} \leftarrow \text{remainder}$$

$$5349 \div 7 = 764 \frac{1}{7}$$

$$\underline{(2x^2 + 5x + 4)} \div (x - 2) \leftarrow \text{divisor}$$

side }
 $\frac{2x^2}{x} = 2x$
 $2x(x-2)$
 $\frac{9x}{x} = 9$
 $9(x-2)$

$$\begin{array}{r} 2x + 9 \\ \hline x-2 \overline{) 2x^2 + 5x + 4} \\ \underline{-(2x^2 + 4x)} \downarrow \\ 9x + 4 \\ \underline{-(9x + 18)} \\ 22 \end{array}$$

22 ← remainder

$$2x + 9 + \frac{22}{x-2}$$

$$(2x^2 - 3x + 4) \div (2x + 1)$$

Side Work

$$\frac{2x^2}{2x} = x$$

$$x(2x+1)$$

$$\frac{-4x}{2x} = -2$$

$$-2(2x+1)$$

$$\begin{array}{r} \underline{2x+1} \quad \overline{) 2x^2 - 3x + 4} \\ \underline{-2x^2 + -x} \\ -4x + 4 \\ \underline{+4x + 2} \\ 6 \end{array}$$

$$x - 2 + \frac{6}{2x+1}$$

①

$$\frac{x^2}{x} = x$$

$$x(x+3)$$

$$\frac{-16x}{x} = -16$$

$$-16(x+3)$$

$$\begin{array}{r} x-16 \\ \hline x+3 \overline{) x^2 - 13x - 48} \\ \underline{+ (-x^2 + 3x)} \\ -16x - 48 \\ \underline{+ (+16x + 48)} \\ 0 \end{array}$$

$$\boxed{x-16}$$

$$x^2 - 13x - 48 = (x+3)(x-16)$$

$$(x^4 + 5x^3 - 7x^2 + 4x + 1) \div (x^2 - 2)$$

Work

$$\frac{x^4}{x^2} = x^2$$

$$x^2(x^2 - 2)$$

$$\frac{5x^3}{x^2} = 5x$$

$$5x(x^2 - 2)$$

$$\frac{-5x^2}{x^2} = -5$$

$$-5(x^2 - 2)$$

$$\begin{array}{r}
 x^2 - 2 \overline{) x^4 + 5x^3 - 7x^2 + 4x + 1} \\
 \underline{+ (-x^4 + 2x^2)} \\
 5x^3 - 5x^2 + 4x + 1 \\
 \underline{+ (-5x^3 + 10x)} \\
 -5x^2 + 14x + 1 \\
 \underline{+ (+5x^2 + 10)} \\
 14x + 11
 \end{array}$$

$$\cancel{\frac{14x}{x^2}} =$$

$$x^2 + 5x - 5 + \frac{14x + 11}{x^2 - 2}$$

2

$$\frac{x^3}{x^2} = x$$

$$x(x^2 - 1)$$

$$\frac{5x^2}{x^2} = 5$$

$$5(x^2 - 1)$$

$$\begin{array}{r} \underline{x^2 - 1} \overline{) x^3 + 5x^2 - 3x - 1} \\ \underline{+ (-x^3 + x)} \\ 5x^2 - 2x - 1 \\ \underline{+ (-5x^2 + 5)} \\ -2x + 4 \end{array}$$

$$x + 5 + \frac{-2x + 4}{x^2 - 1}$$

$$\textcircled{10} \quad (x^2 - 56) \div (x - 3)$$

$$\frac{x^2}{x} = x$$

$$x(x-3)$$

$$\frac{3x}{x} = 3$$

$$3(x-3)$$

$$\begin{array}{r} x - 3 \overline{) x^2 + 0x - 56} \\ \underline{-(x^2 + 3x)} \\ 3x - 56 \\ \underline{-(3x + 9)} \\ -47 \end{array}$$

$$x + 3 + \frac{-47}{x-3}$$