

### Long Division Example 1

$$(x^2 + 2x - 24) \div (x - 4)$$

$$\begin{array}{r} x+6 \\ x-4 \overline{) x^2+2x-24} \\ \underline{(-) x^2-4x} \phantom{24} \\ 6x-24 \\ \underline{(-) 6x-24} \\ 0 \end{array}$$

$\frac{x^2}{x} = x$   
 $\frac{6x}{x} = 6$   
0 - Remainder

Solution:  $x+6$

### Long Division Example 2

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

$$\begin{array}{r} x+4 \\ x(x+1) \overline{) x^2+5x+4} \\ \underline{(-) x^2+1x} \phantom{4} \\ 4x+4 \\ \underline{(-) 4x+4} \\ 0 \end{array}$$

$\frac{x^2}{x} = x$   
 $\frac{4x}{x} = 4$   
0 - Remainder

Solution:  $x+4$

### Long Division Example 3

$$(x^3 - 4x^2 + 6x - 4) \div (x - 2)$$

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

$\frac{x^3}{x} = x^2$   
 $\frac{-2x^2}{x} = -2x$   
 $\frac{2x}{x} = 2$   
0 - Remainder

Solution:  $x^2 - 2x + 2$

### Long Division Example 4

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

$$\begin{array}{r} x+1 \\ x(2x^2+x-3) \overline{) 2x^3+3x^2-2x-3} \\ \underline{(-) 2x^3+x^2-3x} \phantom{-3} \\ 2x^2+x-3 \\ \underline{(-) 2x^2+x-3} \\ 0 \end{array}$$

$\frac{2x^3}{2x^2} = x$   
 $\frac{2x^2}{2x^2} = 1$   
0 - Remainder

Solution:  $x+1$

# Long Division Example 5

$$\frac{x^5 - 7x^3 + x + 1}{x+3}$$

Exponents must be in descending order and have none missing holders when needed

$$\begin{array}{r}
 x+3 \overline{) x^5 + 0x^4 - 7x^3 + 0x^2 + x + 1} \\
 \underline{(-) x^5 + 3x^4} \phantom{+ 0x^3} \\
 -3x^4 - 7x^3 \phantom{+ 0x^2} \\
 \underline{(-) -3x^4 - 9x^3} \phantom{+ 0x^2} \\
 2x^3 + 0x^2 \phantom{+ 0x} \\
 \underline{(-) 2x^3 + 6x^2} \phantom{+ 0x} \\
 -6x^2 + x \phantom{+ 1} \\
 \underline{(-) -6x^2 - 18x} \phantom{+ 1} \\
 19x + 1 \\
 \underline{(-) 19x + 57} \\
 -56 \leftarrow \text{remainder}
 \end{array}$$

$\frac{x^5}{x} = x^4$   
 $\frac{-3x^4}{x} = -3x^3$   
 $\frac{2x^3}{x} = 2x^2$   
 $\frac{-6x^2}{x} = -6x$   
 $\frac{19x}{x} = 19$

Solution:  
 $x^4 - 3x^3 + 2x^2 - 6x + 19 - \frac{56}{x+3}$

# Long Division Example 6

$$(x^5 - 3x^2 - 20)(x-2)^{-1}$$

notation means

$$\begin{array}{r}
 x-2 \overline{) x^5 - 3x^2 - 20} \\
 \underline{(-) x^5 - 2x^4} \phantom{+ 0x^3} \\
 2x^4 + 0x^3 - 3x^2 - 20 \\
 \underline{(-) 2x^4 - 4x^3} \phantom{+ 0x^2} \\
 4x^3 - 3x^2 - 20 \\
 \underline{(-) 4x^3 - 8x^2} \phantom{+ 0x} \\
 5x^2 + 0x - 20 \\
 \underline{(-) 5x^2 - 10x} \phantom{+ 0} \\
 10x - 20 \\
 \underline{(-) 10x - 20} \\
 0 \leftarrow \text{rem.}
 \end{array}$$

$\frac{x^5}{x} = x^4$   
 $\frac{2x^4}{x} = 2x^3$   
 $\frac{4x^3}{x} = 4x^2$   
 $\frac{5x^2}{x} = 5x$

Solution:  
 $x^4 + 2x^3 + 4x^2 + 5x + 10$