

AIM: HOW DO WE DIVIDE POLYNOMIALS? (DAY 2)

**Do Now:** - Use the long division to determine the quotient:

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

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

OH-OH!  
 Now what?  
 we need "place holders"  
 to ensure like terms!

Let's try again!

$$1) \frac{2x^3 - 4x^2 + 2}{2x - 2}$$

$$\begin{array}{r} x^2 - x - 1 \\ 2x-2 \overline{) 2x^3 - 4x^2 + 0x + 2} \\ \underline{-2x^3 + 2x^2} \phantom{+ 0x + 2} \\ -2x^2 + 0x \phantom{+ 2} \\ \underline{+2x^2 - 2x} \phantom{+ 2} \\ -2x + 2 \phantom{+ 2} \\ \underline{+2x - 2} \\ 0 \end{array}$$

$$\boxed{x^2 - x - 1}$$

$$2) \frac{x^5 - 1}{x - 1}$$

$$\begin{array}{r} x^4 + x^3 + x^2 + x + 1 \\ x-1 \overline{) x^5 + 0x^4 + 0x^3 + 0x^2 + 0x - 1} \\ \underline{-x^5 + x^4} \phantom{+ 0x^3 + 0x^2 + 0x - 1} \\ 1x^4 + 0x^3 \phantom{+ 0x^2 + 0x - 1} \\ \underline{-1x^4 + x^3} \phantom{+ 0x^2 + 0x - 1} \\ 1x^3 + 0x^2 \phantom{+ 0x - 1} \\ \underline{-1x^3 + x^2} \phantom{+ 0x - 1} \\ x^2 + 0x \phantom{+ 0x - 1} \\ \underline{-x^2 + x} \phantom{+ 0x - 1} \\ x - 1 \phantom{+ 0x - 1} \\ \underline{-x + 1} \\ 0 \end{array}$$

$$\boxed{x^4 + x^3 + x^2 + x + 1}$$

\*Don't forget to fill in the zero terms if needed!  
 "placeholders"

PRACTICE: Simplify

3)  $(x^3 - 27) \div (x - 3)$

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

4)  $(x^3 - 8) \div (x - 2)$

$$\begin{array}{r}
 \boxed{x^2 + 2x + 4} \\
 x-2 \overline{) x^3 + 0x^2 + 0x - 8} \\
 \underline{-x^3 + 2x^2} \\
 2x^2 + 0x \\
 \underline{-2x^2 + 4x} \\
 4x - 8 \\
 \underline{-4x + 8} \\
 0
 \end{array}$$

5)  $(x^4 + 18x^3 + 71x^2 - 258x - 1512) \div (x - 4)$

$$\begin{array}{r}
 \boxed{x^3 + 22x^2 + 159x + 378} \\
 x-4 \overline{) x^4 + 18x^3 + 71x^2 - 258x - 1512} \\
 \underline{-x^4 + 4x^3} \\
 22x^3 + 71x^2 \\
 \underline{-22x^3 + 88x^2} \\
 159x^2 - 258x \\
 \underline{-159x^2 + 636x} \\
 378x - 1512 \\
 \underline{-378x + 1512} \\
 0
 \end{array}$$

6)  $(x+3)(x-3) - (x+4)(x-4)$  CONJUGATES!

$$x^2 - 3x + 3x - 9 - (x^2 - 4x + 4x - 16)$$

$$(x^2 - 9) - (x^2 - 16)$$

$$x^2 - 9 - x^2 + 16$$

$$\boxed{7}$$