

What about when I am missing exponents??

e) $\frac{p^3 - 3}{p - 1}$ Hint: Put placeholders if your polynomial skips a term!

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

Is $p-1$ a factor of p^3-3 ? no
How do you know?

there is a remainder

f) $\frac{2x^3 + 4x^2 - 5}{x + 3}$

$$\begin{array}{r} 2x^3 + 4x^2 + 0x - 5 \\ \underline{x + 3} \\ (2x^2 - 2x + 6 - \frac{23}{x+3}) \\ x+3 \overline{) 2x^3 + 4x^2 + 0x - 5} \\ \underline{-(2x^3 + 6x^2)} \\ -2x^2 + 0x \\ \underline{-(2x^2 + 6x)} \\ 6x - 5 \\ \underline{-(6x + 18)} \\ -23 \end{array}$$

Is $x+3$ a factor of $2x^3+4x^2-5$? no

How do you know? there is a remainder

Example 2: Determine whether $x + 2$ is a factor of $x^3 + 7x^2 - 5x - 6$: (Hint: if it's a factor, there should be no remainder.)

$$\begin{array}{r} x^2 + 5x - 15 + \frac{24}{x+2} \\ x+2 \overline{) x^3 + 7x^2 - 5x - 6} \\ \underline{-(x^3 + 2x^2)} \\ 5x^2 - 5x \\ \underline{-(5x^2 + 10x)} \\ -15x - 6 \\ \underline{-(-15x - 30)} \\ 24 \end{array}$$

not a factor

Unit 2- Synthetic Division

Name: _____ Period: _____

Objective: I can divide polynomial expressions.

LONG DIVISION REMINDER:

$$(2x^3 - 13x^2 + 26x - 24) \div (x - 4)$$

SYNTHETIC DIVISION: This is an alternative shortcut to long division.

1. Write the coefficients of the dividend so that the degrees of the terms are in descending order.
 - a. (Make sure to put in 0 for a missing term.)
 2. Write the constant 'r' of the divisor in the box for $x - r$. (CHANGE THE SIGN!!)
 3. Bring down the first coefficient.
 4. Multiply the 1st coefficient by r and write the answer down under the 2nd coefficient.
 5. Add those 2 together.
 6. Repeat steps 4 and 5 until done.
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EXAMPLES:

$$(2x^3 - 13x^2 + 26x - 24) \div (x - 4)$$

$$\begin{array}{r|rrrr} 4 & 2 & -13 & 26 & -24 \\ & \downarrow & 8 & -20 & 24 \\ \hline & 2 & -5 & 6 & 0 \end{array}$$

$$2x^2 - 5x + 6$$

$$(x^3 - 2x^2 - 25x + 6) \div (x - 6)$$

$$\begin{array}{r|rrrr} 6 & 1 & -2 & -25 & 6 \\ & \downarrow & 6 & 24 & -6 \\ \hline & 1 & 4 & -1 & 0 \end{array}$$

$$(x^2 + 4x - 1)$$

$$(x^4 - 10x^2 - 2x + 4) \div (x + 3)$$

$$x^4 + 0x^3 - 10x^2 - 2x + 4$$

$$\begin{array}{r|rrrrr} -3 & 1 & 0 & -10 & -2 & 4 \\ & \downarrow & -3 & 9 & 3 & -3 \\ \hline & 1 & -3 & -1 & 1 & 1 \end{array}$$

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