

# Dividing Polynomials

10-16-18

Dividing by a monomial: divide each term in the polynomial by the monomial.

\* divide the #'s and subtract the exponents of variables.

divisor |  $\begin{matrix} \text{Quotient} \\ \text{dividend} \end{matrix}$  Remainder

Divide

\* put polynomials in standard form:

- largest exponent to smallest exponent AND put placeholders in when missing terms.  
 $0x^{\square}$

Multiply

Example:

$$m^2 - 7m - 11 \div m - 8$$

Subtract

$$\begin{array}{r}
 m + 1 \\
 m - 8 \overline{) m^2 - 7m - 11} \\
 \underline{-m^2 - 8m} \quad \downarrow \\
 1m - 11 \\
 \underline{-m - 8} \\
 -3 \\
 \uparrow \\
 \text{remainder}
 \end{array}
 \quad
 \begin{array}{l}
 \leftarrow \\
 \frac{m^2}{m} = m \\
 m(m-8) = m^2 - 8m \\
 -7 - -8 = 1 \\
 \frac{m}{m} = 1 \\
 1(m-8) = m - 8
 \end{array}$$

Bring Down

$$\boxed{m + 1 + \frac{-3}{m-8}}
 \quad
 \begin{array}{l}
 \leftarrow \text{remainder} \\
 \leftarrow \text{divisor}
 \end{array}$$

Repeat

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

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

divide 1<sup>st</sup> term of dividend  
by 1<sup>st</sup> term in divisor.

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

multiply the term in  
the quotient by the  
entire divisor. Put  
under dividend.

$$\textcircled{1} \frac{x}{x} = 1$$

$$\textcircled{2} 1(x-1) = x-1$$

$$x^2(x-1) = x^3 - x^2$$

Subtract polynomials  
under dividend

\* Subtract EACH term

$$-1 - -1 = 0$$

bring down remaining  
terms.

Repeat the steps  
above until the degree  
of the dividend is  
smaller than divisor.

\* if there is a # after  
subtracting, that # is  
part of the remainder.

Remainder = # at end  
divisor

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Examples:

← monomial

$$1. \frac{4x^2}{4x} + \frac{8x}{4x} - \frac{10}{4x} \div 4x$$

$$\boxed{x + 2 - \frac{5}{2x}}$$

$$2. \frac{15x^4}{5x^2} - \frac{20x^2}{5x^2} + \frac{30x}{5x^2} \div 5x^2$$

$$\boxed{3x^2 - 4 + \frac{6}{x}}$$

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

$$3. n^2 - n - 29 \div n - 6$$

$$\begin{array}{r} n+5 \\ n-6 \overline{) n^2 - n - 29} \\ \underline{-n^2 + 6n} \phantom{-29} \\ 5n - 29 \\ \underline{-5n + 30} \\ 1 \end{array}$$

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

$$n(n-6) = n^2 - 6n$$

$$\frac{5n}{n} = 5$$

$$5(n-6) = 5n - 30$$

$$\boxed{= n + 5 + \frac{1}{n-6}}$$

$$4. a^2 - 28 \div a - 5 \quad * \text{ need a place holder}$$

$$a-5 \overline{) a^2 + 0a - 28}$$

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

$$5a - 28 \quad a(a-5) = a^2 - 5a$$

$$\underline{-5a + 25} \quad \frac{5a}{a} = 5$$

-3

$$5(a-5) = 5a - 25$$

$$\boxed{= a + 5 + \frac{-3}{a-5}}$$