

5-2A Dividing Polynomials

- dividing a polynomial by a monomial
- dividing polynomials using long division
- A.APR.6

Polynomial divided by a monomial.

- rewrite original polynomial as several fractions over the monomial.
- simplify each monomial fraction separately.
- the form $(a + b)(c)^{-1}$ symbolizes division. $(a+b)\left(\frac{1}{c}\right) = \frac{a+b}{c}$

Examples: Divide.

1. $x^3y^2 - x^2y + 2x \div -xy$

$$\frac{x^3y^2}{-xy} - \frac{x^2y}{-xy} + \frac{2x}{-xy}$$

$$-x^2y + x - \frac{2}{y}$$

2. $(m^3n^2p - m^2n + n^3p^2 + mp)(mp)^{-1}$

$$\frac{m^3n^2p}{mp} - \frac{m^2n}{mp} + \frac{n^3p^2}{mp} + \frac{mp}{mp}$$

$$m^2n^2 - \frac{mn}{p} + \frac{n^3p}{m} + 1$$

Polynomial divided by a polynomial - Long Division

Let's review old school long division.

divide 2134 by 35

$\begin{array}{r} \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \end{array} \begin{array}{c} X \\ - \\ \cdot \\ \cdot \end{array} \begin{array}{c} - \\ - \\ - \\ - \end{array} \begin{array}{c} \downarrow \\ \downarrow \\ \downarrow \\ \downarrow \\ \downarrow \end{array}$

$$\begin{array}{r}
 60 \overline{) 2134} \\
 \underline{210} \downarrow \\
 34 \\
 \underline{34} \\
 0 \\
 \hline
 34
 \end{array}$$

$\frac{60}{35} = 1 \frac{25}{35}$
 $\frac{25}{35} = \frac{5}{7}$
 $\frac{5}{7} \approx 0.7$
 $1.7 \times 35 = 59.5 \approx 60$

Now let's use the same method to divide a polynomial by another polynomial.

1. Divide $(x^4 - 2x^3 + x^2 - 3x + 2)$ by $(x - 2)$ $\div x \rightarrow \sqrt[5]{10^2}$

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

$x^3 + x - 1$

2. $(5s^3 + s^2 - 7)(s + 1)^{-1}$

missing degrees of the variable

$$\begin{array}{r}
 \overline{) \begin{array}{r} 5s^2 - 4s + 4 \\ 5s^3 + 1s^2 + 0s - 7 \\ \hline 5s^3 + 5s^2 \\ \hline -4s^2 + 0s \\ \hline -4s^2 - 4s \\ \hline 4s - 7 \\ \hline 4s + 4 \\ \hline -11 \end{array} \\
 \hline
 \end{array}$$

$0 + +4$
 $-7 + -4$



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12-19 all (use division of monomials)

21-31 odd (use long division)

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