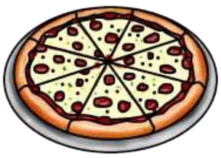
4.3 Dividing Polynomials



I. Dividing a Polynomial by a Monomial

This process is similar to the Distributive Property, only you're dividing instead of multiplying. In other words, divide each term of the polynomial by the monomial.

Examples

(1) $\dfrac{12x^5 - 36x^3 + 4x^2}{2x} = \dfrac{12x^5}{2x} - \dfrac{36x^3}{2x} + \dfrac{4x^2}{2x} = \boxed{6x^4 - 18x^2 + 2x}$

(2) $\dfrac{15a^2b^3 - 25ab^2 + 10a^3b}{5ab} = 3ab^2 - 5b + 2a^2$

II. Dividing a Polynomial by a Polynomial

We will learn two methods for dividing polynomials by polynomials. The first is long division. Before we start, Let's review long division for real numbers. For example, let's do 171 ÷ 3 using long division.

$$\begin{array}{r} 57 \\ 3\overline{)171} \\ -15\downarrow \\ \hline 21 \\ -21 \\ \hline 0 \end{array}$$

Now, your turn. Do 2302 ÷ 12 using long division.

$$\begin{array}{r} 191\tfrac{10}{12} \\ 12\overline{)2302} \\ -12\downarrow \\ \hline 110 \\ -108 \\ \hline 22 \\ -12 \\ \hline 10 \end{array}$$

$191\tfrac{5}{6}$

Now, let's see how it works for polynomials.

A. Long Division

Divide the following using long division.

(1) $\left(x^2-7x+10\right)\div\left(x-2\right)=(x-5)$

$$
\begin{array}{r}
x-5 \\
x-2\overline{)\, x^2-7x+10} \\
\underline{-x^2+2x } \\
-5x+10 \\
\underline{+5x-10} \\
0
\end{array}
$$

(2) $\left(2x^4+3x^3+5x-1\right)\div\left(x^2-2x+2\right)$

Try these on your own.

Divide the following using long division.

#2 **(3)** $\left(x^2+9x+14\right)\div\left(x+7\right)$

$$
\begin{array}{r}
x+2 \\
x+7\overline{)\, x^2+9x+14} \\
\underline{-x^2-7x } \\
2x+14 \\
\underline{-2x-14} \\
0
\end{array}
$$

#3 **(4)** $(x^2+7x-5)\div\left(x-2\right)$

$$
\begin{array}{r}
x+9+13/x-2 \\
x-2\overline{)\, x^2+7x-5} \\
\underline{-x^2+2x } \\
9x-5 \\
\underline{-9x+18} \\
13
\end{array}
$$