Division of Polynomials

7th Hour MATH RTI

Divide the Polynomials by Monomials

$\frac{9x^2 - 3x + 12}{3x} =$	$\frac{8x^3 - x^2 + 2x - 1}{2x} =$
$\frac{x^2 + 5x + 6}{x^2} =$	$\frac{3x^5 - 15x^3 + 6x}{9x} =$
$\frac{11x^5 + 7x^3 - 2x}{x^2} =$	$\frac{x^6 - 4x^4 + 3x^2}{5x^2} =$

Rules in Division of Polynomials

1. Arrange the term of both dividend and divisor in descending powers of the variable.
2. Divide the first term in the dividend by the first term of the divisor, giving the first term of the quotient.
3. Multiply each term of the divisor by the first term of the quotient and subtract the product from the dividend.
4. Use the remainder obtained in Step 3 as a new dividend, repeat Steps 2 and 3.
5. Continue the process until the remainder is reached whose degree should be less than the degree of the divisor.

Solve using Long Division

$$3x^3 + 7x^2 + 7x + 10 \ by \ x + 2$$

Solution:

$$\frac{3x^3}{x} = 3x^2$$

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

$$\frac{5x}{x} = 5$$

$$Answer: 3x^2 + x + 5$$

$$\begin{array}{r} 3x^2 \quad +x \quad +5 \\ x+2 \overline{)3x^3 + 7x^2 + 7x + 10} \\ \underline{-(3x^3 + 6x^2)} \quad\quad\quad\quad \\ x^2 + 7x \quad\quad \\ \underline{-(x^2 + 2x)} \quad\quad \\ 5x + 10 \\ \underline{-(5x + 10)} \\ 0 \end{array}$$

Additional example: Long Div.

Example 1: Divide $\dfrac{2x^3-8x^2+9x-2}{x-2}$ using long division.

$$x-2\overline{)2x^3-8x^2+9x-2}$$

$x-2$ is called the divisor and $2x^3-8x^2+9x-2$ is called the dividend. The first step is to find what we need to multiply the first term of the divisor *(x)* by to obtain the first term of the dividend ($2x^3$). This is $2x^2$. We then multiply $x-2$ by $2x^2$ and put this expression underneath the dividend. The term $2x^2$ is part of the quotient, and is put on top of the horizontal line (above the $8x^2$). We then *subtract* $2x^3 - 4x^2$ from $2x^3-8x^2+9x-2$.

$$\begin{array}{r} 2x^2 \qquad\qquad \\ x-2\overline{)2x^3-8x^2+9x-2} \\ \underline{-(2x^3-4x^2)} \qquad\quad \\ -4x^2+9x-2 \end{array}$$

The same procedure is continued until an expression of lower degree than the divisor is obtained. This is called the remainder.

$$\begin{array}{r} 2x^2-4x+1 \\ x-2\overline{)2x^3-8x^2+9x-2} \\ -\underline{(2x^3-4x^2)} \qquad\quad \\ -4x^2+9x-2 \\ \underline{-(-4x^2+8x)} \quad \\ x-2 \\ \underline{-(x-2)} \\ 0 \end{array}$$

Practice/Exercises: Long Div.

1) $(m^2 - 7m - 11) \div (m - 8)$

2) $(n^2 - n - 29) \div (n - 6)$

3) $(n^2 + 10n + 18) \div (n + 5)$

4) $(k^2 - 7k + 10) \div (k - 1)$

5) $(n^2 - 3n - 21) \div (n - 7)$

6) $(a^2 - 28) \div (a - 5)$