Dividing a Polynomial by a Monomial

Important Ideas

1. To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

2. In each division, like bases are divided by subtracting the exponent in the denominator from the exponent in the numerator.

3. There must be the same number of terms in the **quotient** as there are in the original polynomial.

4. There will be some problems where the numerator and the denominator do not have a common factor.

To Divide by Monomials

1. Rewrite the division so that each term of the polynomial is divided by the monomial.

2. Divide the numerical coefficients.

3. Divide like bases by subtracting the exponents.

4. Rewrite any negative exponents in their equivalent forms with a positive exponent.   This term will be a fraction.

5. If there is a factor in the denominator which is not also in the numerator, write that term as a

fraction.

Example 1: Simplify:

$$\frac{15x^3 - 10x^2 + 5x}{5x}$$

Break it up into parts

$$\frac{15x^3}{5x} - \frac{10x^2}{5x} + \frac{5x}{5x}$$

Take each fraction individually, and work with like terms

$$\frac{15}{5} = 3 \qquad \frac{x^3}{x} = x^2$$

$$\frac{-10}{5} = -2 \qquad \frac{x^2}{x} = x$$

$$\frac{5}{5} = 1 \qquad \frac{x}{x} = 1$$

$$3x^2 - 2x + 1$$

Example 2: Simplify

$$\frac{12x^4 - 9x^2 + 7}{7x^2}$$

Break it up into parts

$$\frac{12x^4}{7x^2} - \frac{9x^2}{7x^2} + \frac{7}{7x^2}$$

Take it part by part

$$\frac{12}{7} = \frac{12}{7} \qquad \frac{x^4}{x^2} = x^2$$

$$\frac{9}{7} = \frac{9}{7} \qquad \frac{x^2}{x^2} = 1$$

$$\frac{7}{7} = 1 \qquad \frac{1}{x^2} = \frac{1}{x^2}$$

$$\frac{12x^2}{7} - \frac{9}{7} + \frac{1}{x^2} \quad or \quad \frac{12x^2}{7} - \frac{a}{7} + x^{-2}$$