## 5.5 Dividing Polynomials

**Definition 5.5.1** (Quotient Rule for Exponents)
$\frac{b^x}{b^y} = b^{x-y}$

**Example 5.5.1**
Simplify each of the following:

1. $\frac{5^{12}}{5^4} =$

2. $\frac{x^9}{x^2} =$

3. $\frac{y^3}{y^5} =$

What if, however, both exponents match?

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

Why does this work?

**Definition 5.5.2** (Zero-Exponent Rule)
$b^0 = 1$ for any $b \neq 0$

**Example 5.5.2**
Simplify each:

1. $14^0 =$
2. $(-10)^0 =$
3. $-10^0 =$
4. $20x^0 =$
5. $(20x)^0 =$

**Definition 5.5.3** (Powers of Quotients)
$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

**Example 5.5.3**
Simplify each:

1. $\left(\frac{x}{5}\right)^2 =$
2. $\left(\frac{x^4}{2}\right)^3 =$
3. $\left(\frac{2a^{10}}{b^3}\right)^4 =$

**Example 5.5.4**
Find

$$(-15x^9 + 6x^5 - 9x^3) \div 3x^2$$

**Example 5.5.5**
Find

$$\frac{25x^9 - 7x^4 + 10x^3}{5x^3}$$

**Example 5.5.6**
Find

$$\frac{18x^7y^6 - 6x^2y^3 + 60xy^2}{6xy^2}$$