

## Chapter 4 Polynomials

## Section 4.1 Monomials

Monomial is an expression that is a number, a variable, or the product of a number and one or more variables.

## Monomials

$$5b \quad -w \quad 23 \quad \frac{1}{3}x^3y^4 \quad x^2$$

## Not Monomials

$$\frac{1}{n^4} \quad \sqrt[3]{x} \quad x+8 \quad a^{-1}$$

**Degree** of a monomial is the sum of its exponents.

$$12x^3y^2z^1 \quad 3 + 2 + 1 = 6^{\text{th}} \quad 6ab^4 \quad 5^{\text{th}}$$

$$8x^2yz^6 \quad 9^{\text{th}}$$

## Negative exponents

$$\frac{a^{-n}}{1} = \frac{1}{a^n}$$

$$\frac{1}{a^{-n}} = a^n$$

$$-3a^{-4} = \frac{-3}{a^4}$$

$$\frac{2^{-3}}{1} = \frac{1}{2^3} = \frac{1}{8}$$

$$\frac{1}{b^{-8}} = b^8$$

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

Product of Powers

$$(2x^3)(4x^2)$$

$$a^m \cdot a^n = a^{m+n}$$

Simplify

$$(b^3)(a^2b^4) \quad a^2 b^7$$

$$(2x^2y^6z^{10})(5x^6z^4) = 10x^8y^6z^{14}$$

$$(3x^4y^2a^3)(2x^3y^3a^{-1}) \quad 6x^7y^5a^2$$

$$(2x^3)(4y^2) \quad 8x^3y^2$$

$$x^1 \cdot x^1 = x^2$$

Simplify

$$(a^{10}y^{-3}a^5)(2x^{-8}y^4a^{-11})$$

$$2a^4yx^{-8} \quad \frac{2a^4y}{x^8}$$

$$(ab^{-6}c^7)(a^{-3}b^7c^{-5})$$

$$a^{-2}b^1c^2 \quad \frac{bc^2}{a^2}$$

## Power of a Power Rule

$$(a^m)^n = a^{m \cdot n}$$

$$(3x^3y^4)^2 = 3^2 x^6 y^8 = 9x^6y^8$$

$$(a^4b^2)^3 = a^{12} b^6$$

$$a^4 \cdot a^4 \cdot a^4 = a^{12}$$

$$(a^{-3}b^1c^2)^4 = a^{-12} b^4 c^8 = \frac{b^4 c^8}{a^{12}}$$

$$(2x^4b^{-5}y^3)^{-3} = 2^{-3} x^{-12} b^{15} y^{-9} = \frac{b^{15}}{8x^{12}y^9}$$

$$-2 \cdot 3 = -8$$

$$(3x^{-2}y^3z^4)^{-2}$$

$$\begin{aligned} & (2x^3b^2y^{-2})^2(x^2b^6y^2) \\ & (4x^6b^4y^{-4})(x^2b^6y^2) \\ & 4x^8b^{10}y^{-2} = \frac{4b^{10}x^8}{y^2} \end{aligned}$$

## Quotient of Powers

$$\frac{x^5}{x^3}$$

$$\frac{a^m}{a^n} = a^{m-n}$$

$$\frac{p^3}{p^8}$$

$$\frac{3a^4y^{10}}{9ay^{13}}$$

$$\frac{12x^{-4}y^{-3}z^{-8}}{30x^{-6}y^{-6}z^{-10}}$$

$$\left(\frac{2a^4b^{-2}c}{3a^{-5}b^3c}\right)^4$$

Zero Power Rule

$$a^0 = 1$$

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

$$\frac{a^4b^6c^3}{a^5b^6c}$$

$$\left(\frac{2x^2}{xy^{-3}}\right)^3$$

## Scientific Notation

$$a \times 10^n \quad \text{where} \quad 1 \leq a < 10$$

683,000

0.00000435

$$\frac{4 \times 10^{16}}{3 \times 10^8}$$

$$(4 \times 10^5)(3 \times 10^7)$$