

## Notes 5.1

### **Multiplication of Powers Property**

$$x^a \cdot x^c = x^{a+c} \quad x^4 \cdot x^6 = x^{10} \quad x^9 y^5 \cdot x^3 y^2 = x^{12} y^7 \quad 6w^4 x^8 y^2 \cdot 5xy^3 = 30w^4 x^9 y^5$$

### **Division of Powers Property**

$$\frac{x^a}{x^c} = x^{a-c} \quad \frac{x^9}{x^5} = x^4 \quad \frac{x^{10} y^3}{x^6 y^8} = \frac{x^4}{y^5} \quad \frac{12w^3 x y^{13}}{10x^7 y^{11} z} = \frac{6w^3 y^2}{5x^6 z}$$

### **Power of a Product Property**

$$(ac)^n = a^n c^n \quad (ac)^5 = a^5 c^5 \quad (10mn)^2 = 10^2 m^2 n^2 = 100m^2 n^2 \quad (5w^2)^3 = 5^3 (w^2)^3 = 125w^6$$

### **Power of a Quotient Property**

$$\left(\frac{a}{c}\right)^n = \frac{a^n}{c^n} \quad \left(\frac{a}{c}\right)^6 = \frac{a^6}{c^6} \quad \left(\frac{5a}{cd^4}\right)^2 = \frac{(5a)^2}{(cd^4)^2} = \frac{5^2 a^2}{c^2 (d^4)^2} = \frac{25a^2}{c^2 d^8}$$

### **Power of a Power Property**

$$(n^a)^c = n^{ac} \quad (n^3)^4 = n^{12} \quad (10m^7)^2 = (10)^2 \cdot (m^7)^2 = 100m^{14}$$
$$(5w^6 xy^2)^3 = (5)^3 \cdot (w^6)^3 \cdot (x)^3 \cdot (y^2)^3 = 125w^{18} x^3 y^6$$

### **Definition of Negative Exponents**

$$m^{-1} = \frac{1}{m} \quad m^{-3} = (m^{-1})^3 = \left(\frac{1}{m}\right)^3 = \frac{1}{m^3} \quad \left(\frac{a}{c}\right)^{-3} = \left(\frac{c}{a}\right)^3 = \frac{c^3}{a^3} \quad \frac{a^{-1} c^4}{x^2 y^{-5}} = \frac{c^4 y^5}{a x^2}$$

### **Other Notes:**

$0^0$  is **Undefined**. Any other number raised to the zero power will always equal 1.

$$5^0 = 1 \quad 100^0 = 1 \quad 1.9^0 = 1 \quad \left(\frac{5}{8}\right)^0 = 1 \quad x^0 = 1, x \neq 0$$

If an exponent is not indicated then it is understood to be 1

$$x = x^1 \quad 6m = 6m^1 \quad 7a^3 c = 7a^3 c^1$$