

Rewrite as  $x$  to a power - be prepared to explain

1)  $x^3 \cdot x^5$   
~~xxxxxxx~~  
 $x=2$   
 $2^3 \cdot 2^5 = 8 \cdot 32 = 256$   
 $2^8 = 256$

2)  $x^3 + x^5 = x^3 + x^5$

3)  $\frac{x^5}{x^3}$   
~~xxxxx~~  
~~xxx~~  
 $2^5 = 32$   
 $2^3 = 8$   
 $\frac{32}{8} = 4$   
 $2^2 = 4$   
 ~~$2^{1.66} \approx 3.16$~~

4)  $\frac{x^3}{x^5}$   
~~xxx~~  
~~xxxxx~~  
 $x^{-2} = \frac{1}{x^2}$

5)  $(x^3)^5 = x^3 \cdot x^3 \cdot x^3 \cdot x^3 \cdot x^3$   
 $x^{3 \cdot 5} = x^{15}$

6)  $(3x^4)^5 = 3x^4 \cdot 3x^4 \cdot 3x^4 \cdot 3x^4 \cdot 3x^4$   
 $3^5 (x^4)^5 = 3^5 x^{20}$   
 $\approx 243 x^{20}$

Properties of exponents  
product property

$$\underbrace{x^a \cdot x^b = x^{a+b}}_{\text{Base is the same}}$$

$$x^3 \cdot y^4 = xxxyyyyy$$

Quotient property

$$\frac{x^a}{x^b} = x^{a-b}, \quad x \neq 0$$

neg exponents

(take reciprocal)

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

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

$$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$$

power of a power

$$(x^a)^b = x^{a \cdot b}$$

power of a product

$$(x \cdot y)^n = x^n \cdot y^n$$

not  
mult

$$\rightarrow (x+y)^n \neq x^n + y^n$$

$$(x+y)(x+y)(x+y)(x+y) \dots$$

Rewrite as  $x$  to a power - be prepared to explain

$$x=3 \quad 3^3 \cdot 3^5 = 6561$$

$$1) \quad x^3 \cdot x^5 = \cancel{3^{15}} = \cancel{11348907} \\ \text{xxx xxxxx} \quad 3^8 = 6561$$

$$2) \quad x^3 + x^5$$

$$\frac{x^3}{x^5} = x^3 \cdot x^{-5} = x^{-2}$$

$$3) \quad \frac{x^5}{x^3} = \frac{\cancel{x} \cancel{x} \cancel{x} x x}{\cancel{x} \cancel{x}} = x^2 \\ 5-3=2$$

$$4) \quad \frac{x^3}{x^5} = x^{3-5} = x^{-2} \\ = \frac{\cancel{x} \cancel{x} \cancel{x}}{\cancel{x} \cancel{x} \cancel{x} x x} = \frac{1}{x^2}$$

$$5) \quad (x^3)^5 = \cancel{x^3} \cdot x^3 \cdot x^3 \cdot x^3 \cdot x^3$$

$$6) \quad (3x^4)^5 \\ 3x^4 \cdot 3x^4 \cdot 3x^4 \cdot 3x^4 \cdot 3x^4 \\ 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot x^4 x^4 x^4 x^4 x^4 \\ \underbrace{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}_3 (x^4)^5 = 243x^{20}$$

Quotient Property

$$\frac{x^a}{x^b} = x^{a-b}, \quad x \neq 0$$

Negative exponents  
(reciprocal)

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

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

$$\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^n$$

power of a power

$$(x^a)^b = x^{a \cdot b}$$

power of a product

$$(x \cdot y)^n = x^n \cdot y^n$$

power of a quotient

$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

NOT A Property

$$(x+y)^n \neq x^n + y^n$$