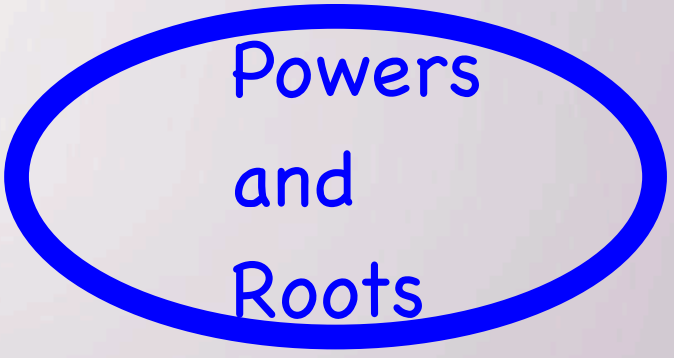
REVIEW



Basics of Powers

2^5 means = 2 multiplied by itself 5 times

2^0 means = 1 (1. no twos)

2^{-5} means = $\frac{1}{2^5} = \frac{1}{32}$ 1 divided by (five twos multiplied together)

$2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 32$ ÷2

$2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$ ÷2

$2^3 = 8$ ÷2

$2^2 = 4$ ÷2

$2^1 = 2$ ÷2

$2^0 = 1$ ÷2

$2^{-1} = \frac{1}{2}$ ÷2

$2^{-2} = \frac{1}{4}$ ÷2

$2^{-3} = \frac{1}{8}$ ÷2

EX 1: Evaluate these.

a) $4^3 = 4 \cdot 4 \cdot 4 = 64$

b) $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

c) $8^0 = 1$

d) $9^1 = 9$

Power Rules

When multiplying powers of a like base, *add* the exponents.

$2^3 \, 2^5 =$ $2\cdot2\cdot2 \cdot 2\cdot2\cdot2\cdot2\cdot2 = 2^8$

When dividing powers of a like base, *subtract* the exponents.

$\frac{2^7}{2^5} =$ $\frac{2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2}{2\cdot2\cdot2\cdot2\cdot2} = 2^2$ $\qquad \frac{2^7}{2^5} = 2^{7-5} = 2^2$

When a power is raised to another power, *multiply* the exponents.

$(2^3)^4 =$ $(2\cdot2\cdot2)(2\cdot2\cdot2)(2\cdot2\cdot2)(2\cdot2\cdot2)$ $\qquad (2^3)^4 = 2^{3\cdot4}$

$= 2^{12}$ $\qquad = 2^{12}$

EX 2: Evaluate these.

a) $5^3 \, 5^4 =$ $5^{3+4} = 5^7$

b) $(3^2)^4 =$ $3^{2\cdot4} = 3^8$

c) $\frac{4^7}{4^5} =$ $4^{7-5} = 4^2 = \boxed{16}$

d) $\frac{3^4}{3^7} =$ $3^{4-7} = 3^{-3} = \boxed{\frac{1}{3^3}}$

EX 3: Evaluate these.

Power Rules

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

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

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

a) $\frac{3^2 \cdot 2^4}{2^5 \cdot 3^3} = 2^{4-5} \cdot 3^{2-3} = 2^{-1} \cdot 3^{-1} = \frac{1}{2} \cdot \frac{1}{3} = \frac{1}{6}$

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

c) $\frac{3^3 \cdot 2^5}{2^4 \cdot 3^2} = 3^{3-2} 2^{5-4} = 3^1 \cdot 2^1 = 3 \cdot 2 = 6$

d) $\frac{(3^3 \cdot 2^4)^2}{(2^5 \cdot 3^2)^3} = \frac{(3^3)^2 (2^4)^2}{(2^5)^3 (3^2)^3} = \frac{3^6 2^8}{2^{15} 3^6}$

$= 3^{6-6} 2^{8-15} = 3^0 2^{-7} = \frac{1}{2^7}$

Basics of Roots

$\sqrt{81} = 9$ *because* $9^2 = 81$

$\sqrt[3]{64} = 4$ *because* $4^3 = 64$

$\sqrt[4]{16} = 2$ *because* $2^4 = 16$

$\sqrt[5]{243} = 3$ *because* $3^5 = 243$

EX 4: Evaluate these.

a) $\sqrt[5]{32} = 2$ because $2^5 = 32$

b) $\sqrt[4]{81} = 3$ because $3^4 = 81$

c) $\sqrt[3]{125} = 5$ " $5^3 = 125$

d) $\sqrt{10{,}000} = 100$ because $100^2 = 10000$