AA PREP—EVALUATING EXPONENTS LECTURE

Exponent Rules For $a \neq 0, b \neq 0$	
Product Rule	$a^x \times a^y = a^{x+y}$
Quotient Rule	$a^x \div a^y = a^{x-y}$
Power Rule	$(a^x)^y = a^{xy}$
Power of a Product Rule	$(ab)^x = a^x b^x$
Power of a Fraction Rule	$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$
Zero Exponent	$a^0 = 1$
Negative Exponent	$a^{-x} = \frac{1}{a^x}$
Fractional Exponent (EXPONENT → x, INDEX → y)	$a^{\frac{x}{y}} = \sqrt[y]{a^x}$

$\frac{a^x}{a^y}$

EX $25^{\frac{1}{2}} = \sqrt[2]{25} = 5$

EX 1: Evaluate each expression <u>without</u> using a calculator.

a) 3^0 1	b) 3^1 3	c) 3^2 $3 \cdot 3$ 9	d) 3^3 $3 \cdot 3 \cdot 3$ 27	e) 3^4 $3 \cdot 3 \cdot 3 \cdot 3$ 81
f) $(-3)^0$ 1	g) $(-3)^1$ -3	h) $(-3)^2$ $-3 \cdot -3$ 9	i) $(-3)^3$ $-3 \cdot -3 \cdot -3$ -27	j) $(-3)^4$ $-3 \cdot -3 \cdot -3 \cdot -3$ 81
k) -3^0 $-1 \cdot 3^0$ $-1 \cdot 1$ -1	l) -3^1 $-1 \cdot 3^1$ -3	m) -3^2 $-1 \cdot 3^2$ -9	n) -3^3 $-1 \cdot 3^3$ -27	o) -3^4 $-1 \cdot 3^4$ -81

EX 2: Evaluate each expression <u>without</u> using a calculator.

a) 4^{-2}

$\frac{1}{4^2}$

$\frac{1}{16}$

b) $(-2)^{-5}$

$\frac{1}{(-2)^5}$

$\frac{1}{-32}$

c) -2^{-5}

$-1 \cdot 2^{-5}$

$-1 \cdot \frac{1}{2^5}$

$-1 \cdot \frac{1}{32}$

$-\frac{1}{32}$

$\frac{-1}{32} = \frac{1}{-32} = -\frac{1}{32}$

ALL SAME

d) $\left(\frac{1}{2}\right)^{-4}$

$\left(\frac{2}{1}\right)^{4}$

$(2)^4$

16

e) $\left(-\frac{2}{5}\right)^{-3}$

$\left(-\frac{5}{2}\right)^{3}$

$\frac{-125}{8}$

f) $16^{\frac{1}{2}}$

$\sqrt[2]{16}^{1}$

4^1

4

g) $27^{\frac{1}{3}}$

$\sqrt[3]{27}^{1}$

3^1

3

h) $16^{\frac{1}{4}}$

$\sqrt[4]{16}^{1}$

2^1

2

i) $64^{\frac{2}{3}}$

$\sqrt[3]{64}^{2}$

4^2

16

j) $64^{\frac{3}{2}}$

$\sqrt[2]{64}^{3}$

8^3

512

k) $64^{\frac{8}{6}}$ $\frac{4}{3}$

$\sqrt[6]{64}^{8}$

$2^8 = 256$

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

$4^4 = 256$

l) $81^{\frac{6}{8}}$ $\frac{3}{4}$

$\sqrt[4]{81}^{3}$

3^3

27

m) $81^{-\frac{3}{2}}$

$\sqrt[2]{81}^{-3}$

9^{-3}

$\frac{1}{9^3}$

$\frac{1}{729}$

n) $\left(\frac{1}{125}\right)^{\frac{2}{3}}$

$\sqrt[3]{\frac{1}{125}}^{-2}$

$\frac{\sqrt[3]{1}}{\sqrt[3]{125}} = \left(\frac{1}{5}\right)^{-2}$

$\left(\frac{5}{1}\right)^{2}$

$(5)^2$

25

o) $\left(\frac{9}{4}\right)^{-\frac{5}{2}}$

$\sqrt[2]{\frac{9}{4}}^{-5}$

$\frac{\sqrt[2]{9}}{\sqrt[2]{4}} = \left(\frac{3}{2}\right)^{-5}$

$\left(\frac{2}{3}\right)^{5}$

$\frac{32}{243}$