

AA PREP—OPERATIONS WITH 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	$a^{\frac{x}{y}} = \sqrt[y]{a^x}$

EX 1: BASICS

Simplify each expression, assuming that no variable equals zero. Write answers with positive exponents only!

a) $x^4 \cdot x^2$	b) $(x^4)^2$
c) $\frac{x^5}{x^3}$	d) $\frac{x^3}{x^5}$
e) $\frac{x^{-3}}{x^5}$	f) $\frac{x^3}{x^{-5}}$
g) $12x^0$	h) $(12x)^0$

EX 2: MORE COMPLICATED

Simplify each expression, assuming that no variable equals zero. Write answers with positive exponents only!

a) $-5x^4y^3 \cdot 2x^6y^{11}$

b) $(-5x^4y^3)^2$

c) $(-2x^3y^5)(-8x^0y)$

d) $(-3x^4y^5)^2(-2x^5y^7)^3$

e) $\frac{4x^{12}y^{-2}}{20xy^8}$

f) $\frac{12^{-1}x^{-7}y}{6^{-2}x^{-4}y^{-9}}$

g) $\left(\frac{15x^2y}{-3x^{-6}y^{-4}}\right)^{-2}$

h) $\left(\frac{2x^{-3}}{5(2x^4)^3}\right)^{-2} \cdot (-2x^{-5}y^{-6})^{-3}$