

## Lesson 2.01 Laws of Exponents

Students will be able to:

- Content Objective: Use the properties of exponents to evaluate expressions containing exponents.
- Language Objective: Write an explanation as to why certain types of exponential equations have no solution.



## Warm Up

Simplify the following expressions containing exponents.

a.  $3y \cdot 4y^2$

b.  $\frac{8a^{10}}{4a^6}$

c.  $(2x^3)^2$



## Vocabulary Review

## Product Rule

$$z^x \cdot z^y =$$

## Quotient Rule

$$\frac{z^x}{z^y} =$$

## Zero Power Rule

$$z^0 =$$

## Power to a Power Rule

$$(x^a)^b =$$

Extended Power Rule  
(Multiplication)

$$(xy)^b =$$

Extended Power Rule  
(Division)

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

## Negative Exponents

$$x^{-a} =$$



## Skill 1: Multiplying &amp; Dividing Powers

Fully simplify the following expressions. Your answer should only contain positive exponents.

a.  $5x^4y^4(2x^3y^3)$

b.  $2a(-3a^{-4})$



## Exercise 1: Multiplying &amp; Dividing Powers

Fully simplify the following expressions. Your answer should only contain positive exponents.

a.  $15a^3bc^4(2b^2c)$

b.  $-11y^2(3y^{-3})$

c.  $\frac{8x^6y^8}{4x^6}$

d.  $\frac{100zx^4}{16z^4x^2}$

c.  $\frac{5x^7y^4}{125x^4y^2}$

d.  $\frac{8y^3x^5}{16y^4x^2}$



## Skill 2: Powers to Powers

Fully simplify the following expressions. Your answer should only contain positive exponents.

a.  $(-5x^3y^4z^2)^3$

b.  $(2ef^{-2})^{-2} \cdot (3e^4f^5)^0$

c.  $\left(\frac{2f^{-2}g^0}{g^5}\right)^{-2}$



## Exercise 2: Powers to Powers

Fully simplify the following expressions. Your answer should only contain positive exponents.

a.  $(6p^2q^3r)^2$

b.  $(-3x^4y^5)^{-3} \cdot 4x^4$

c.  $\left(\frac{2xy^3}{3z^2}\right)^3$



## Write It Out

Exponential functions are functions containing a variable exponent. When evaluating an exponential function of the form  $y = a(b)^x$ , the rules of exponents still apply.

1. Evaluate the function  $f(x) = 4(2)^x$  at the values below without the use of a calculator.

a.  $f(2)$

b.  $f(0)$

c.  $f(-2)$

d. Which of the following values above represents the **y-intercept** of the exponential function? How do you know?



## Check Point

Fully simplify the following expressions. Your answer should only contain positive exponents.

$$\frac{6a^2b^3}{(-4a^4b)(-3a^3b^2)}$$



## 2.01 Problem Set

Name: \_\_\_\_\_

**Part I**-Fully simplify the following expressions. Your answer should only contain positive exponents.

1.  $\frac{2x^3y^4 \cdot 3y^{-2}}{4x^0y^3}$

2.  $\frac{(2a^3b^4)^4}{ba^3}$

3.  $(3k^7m)^{-2}(2m)^0$

4.  $\frac{2u^4v^4}{(2u^2v^{-1})^{-4}}$

**Part II**- Evaluate the function  $f(x) = \frac{1}{2}(4)^x$  at the values below. DO NOT use a calculator.

a.  $f(3)$

b.  $f(0)$

c.  $f(-2)$

d.  $f(-1)$

e.  $f(-3)$

f.  $f(1)$

g. A student wants to solve the equation  $0 = \frac{1}{2}(4)^x$ . Is there a solution to this equation? Explain.