8.3 Define and Use Zero and Negative Exponents

Goal • Use zero and negative exponents.

Your Notes

DEFINITION OF ZERO AND NEGATIVE EXPONENTS

Words	Algebra	Example
a to the zero power is 1.	$a^0 =$ ___, $a \neq 0$	$5^0 =$ ___
a^{-n} is the reciprocal of a^n.	$a^{-n} =$ ___, $a \neq 0$	$2^{-1} =$ ___
a^n is the reciprocal of a^{-n}.	$a^n =$ ___, $a \neq 0$	$2 =$ ___

Example 1 *Use definition of zero and negative exponents*

Evaluate the expression.

a. $2^{-3} =$ ___ — **Definition of** _____

$=$ ___ — **Evaluate exponent.**

b. $(-10)^0 =$ ___ — **Definition of** _____

c. $\left(\frac{1}{4}\right)^{-3} =$ ___ — **Definition of** _____

$=$ ___ — **Evaluate exponent.**

$=$ ___ — **Simplify.**

d. $0^{-7} =$ _____ — a^{-n} **is defined only for a** _____ **number** a.

Your Notes

PROPERTIES OF EXPONENTS

Let a and b be real numbers, and let m and n be integers.

$a^m \cdot a^n = a$_____ _____ **property**

$(a^m)^n = a$_____ _____ **property**

$(ab)^m =$ _____ _____ **property**

$\frac{a^m}{a^n} = a$_____, $a \neq 0$ _____ **property**

$\left(\frac{a}{b}\right)^m =$ _____, $b \neq 0$ _____ **property**

Example 2 ***Evaluate exponential expressions***

Evaluate the expression.

a. $(-5)^4 \cdot (-5)^{-4} =$ _____ **Product of powers property**

$=$ ____ _____ **exponents.**

$=$ ___ **Definition of** _____

b. $(5^{-2})^{-2} =$ _____ _____ _____ **property**

$=$ ____ _____ **exponents.**

$=$ _____ **Evaluate power.**

c. $\frac{1}{4^{-2}} =$ ____ **Definition of** _____ _____

$=$ ____ **Evaluate power.**

d. $\frac{3^2}{3^{-1}} =$ _____ _____ _____ **property**

$=$ ____ _____ **exponents.**

$=$ ____ **Evaluate power.**

Your Notes

✔ ***Checkpoint*** **Evaluate the expression.**

1. $\left(\frac{1}{8}\right)^{-1}$	**2.** $\frac{1}{3^{-2}}$
3. $\frac{6^{-1}}{6}$	**4.** $(5^{-1})^2$

Example 3 ***Use properties of exponents***

Simplify the expression $\frac{2w^{-3}x}{(2wx)^2}$. Write your answer using only positive exponents.

Solution

$\frac{2w^{-3}x}{(2wx)^2}$ = _____ **Definition of negative exponents**

= _____ _____ **property**

= _____ _____ **property**

= _____ _____ **property**

✔ ***Checkpoint*** **Simplify the expression.**

5. $\frac{6fg^{-4}}{2f^2g}$	**6.** $(3yz^2)^{-2}$

Homework