

# CHAPTER 3.

## RATIONAL EXPONENTS

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Links to videos

### **Lesson 3.1**

Properties of exponents (a review): <https://www.youtube.com/watch?v=GNHDnodQIjU>

Evaluating exponents: [https://www.youtube.com/watch?v=UhAP\\_W-3UXs&t=33s](https://www.youtube.com/watch?v=UhAP_W-3UXs&t=33s)

Simplifying using properties of exponents 1:

<https://www.youtube.com/watch?v=IlqlUrPsGsU&t=439s>

Simplifying using properties of exponents 2: <https://www.youtube.com/watch?v=DohFwps3alE>

### **Lesson 3.2**

Nth roots of nth powers of variables: <https://www.youtube.com/watch?v=L7CuJrWg1f0>

Introduction to rational exponents: <https://www.youtube.com/watch?v=eyRFw-iuYaQ&t=3s>

Simplifying rational exponents: <https://www.youtube.com/watch?v=k2PEilRp838&t=250s>

### **Lesson 3.3**

Simplifying radical expressions with numeric radicands:

<https://www.youtube.com/watch?v=DeC4iR3-Q8Y&t=231s>

### **Lesson 3.4**

Adding and subtracting like radical expressions:

<https://www.youtube.com/watch?v=lMe8Loeysz8&t=66s>

### **Lesson 3.5**

Multiplying radical expressions: <https://www.youtube.com/watch?v=Jrwt0TelFhI&t=2s>

Multiplying radical expressions with two term factors:

<https://www.youtube.com/watch?v=2UJJsK36Ogc>

### **Lesson 3.6**

Division of radical expressions (monomial over monomial):

[https://www.youtube.com/watch?v=KivGEAGg\\_MA&=&t=4s](https://www.youtube.com/watch?v=KivGEAGg_MA&=&t=4s)

Rationalizing the denominator (monomial denominator):

<https://www.youtube.com/watch?v=bDthpZeSgvo&t=353s>

Rationalizing the denominator (monomial, index > 2):

<https://www.youtube.com/watch?v=BVOFeflJHBI&t=195s>

Rationalizing the denominator (binomial denominator):

<https://www.youtube.com/watch?v=L9zAtzLezGs&t=688s>

More rationalizing the denominator (binomial denominator):

<https://www.youtube.com/watch?v=jdaHidVijmg&t=544s>

### **Lesson 3.7**

Solving radical equations: <https://www.youtube.com/watch?v=kmAHKtEr9f8&t=77s>

Solving radical equations 2: <https://www.youtube.com/watch?v=pzTtQvQlu-s&t=2s>

## Lesson 3.1. Properties of Exponents

### Objectives:

- Understand and apply properties of exponents
- Express numbers in scientific notation
- Multiply and divide numbers in scientific notation

### Part A. Preparing for Lesson 3.1

1.) Assume that  $a$  and  $b$  are real numbers;  $r$  and  $s$  are integers. Fill in the following properties of exponents:

a)  $a^r \cdot a^s =$  \_\_\_\_\_

b)  $(a^r)^s =$  \_\_\_\_\_

c)  $(ab)^r =$  \_\_\_\_\_

d)  $a^{-r} =$  \_\_\_\_\_, ( $a \neq 0$ )

e)  $\left(\frac{a}{b}\right)^r =$  \_\_\_\_\_, ( $b \neq 0$ )

f)  $\frac{a^r}{a^s} =$  \_\_\_\_\_, ( $a \neq 0$ )

g)  $a^0 =$  \_\_\_\_\_, ( $a \neq 0$ )

Assume all variables are nonzero for all problems.

2.) Evaluate each of the following.

a)  $6^2$

b)  $(-6)^2$

c)  $-6^2$

d)  $-(-6)^2$

e)  $6^{-2}$

f)  $(-0.4)^2$

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

h)  $\left(-\frac{1}{7}\right)^{-1}$

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

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

k)  $12xy^0$

l)  $\left(\frac{2}{5}x\right)^0$

3.) Simplify and write the answer with positive exponents only.

a)  $x^5 \cdot x^6$

b)  $y^{-6} \cdot x^8$

c)  $(2p^2q^{-4})^3$

d)  $\frac{x^9}{x^4}$

e)  $\frac{x^9}{x^{-4}}$

f)  $\frac{x^{-9}}{x^{-4}}$

g)  $(4x^2)^3 \left(\frac{1}{2}y^{-2}\right)^4$

h)  $(5m^{-2}n^3)^3$

i)  $\left(-\frac{1}{5}x^2\right)^{-3} \left(\frac{2}{5}x^{-10}\right) \left(\frac{2}{3}x^4\right)^0$

4.) Simplify and write the answer with positive exponents only.

a)  $\frac{(2x^{-5})^3 (x^2)^{-4}}{x^{-12}}$

b)  $\frac{(x^{-3})^2 (-3x^2)^{-1}}{x^{-8}}$

c)  $\frac{(6x^{-3}y^{-5})^{-2}}{(3x^{-4}y^{-3})^3}$

d)  $\frac{-7w^{-3}v^6}{35w^{-4}v^2}$

## Lesson 3.1. Properties of Exponents

### Part B. Apply the Concepts

1.) Simplify and write the answer with positive exponents only.

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

b)  $(2x^5 y^{-3})^3 (3x^{-3} y^2)^{-1}$

c)  $\left(\frac{-5x^{-3} y^0 z^7}{2x^4 y^2 z}\right)^{-2}$

d)  $\left(\frac{8x^{-4} y^3}{125x^3 y^{-2}}\right)^0$