**Barron’s Let’s Review Regents – Algebra II**

# Chapter 3: Exponential and Logarithmic Expressions and Equations

## 3.1 Properties of Exponents

**Key Ideas**

An expression like is called an *exponential expression*. It has a *base*, which in this case is the number 2, and an *exponent*, which in this case is the number 5. For positive integer exponents, the expression can be evaluated by multiplying the base by itself the number of times of the exponent.

**Multiplying Exponential Expressions**

When two exponential expressions that have the same base are multiplied, the product can be written as an exponential expression that has that base but whose exponent is the sum (not the product) of the exponents. If the bases are different, there is no simple way to multiply the expressions.

**Example 1**

Simplify .  
(3)

**Dividing Exponential Expressions**

When two exponential expressions that have the same base are divided, the product can be written as an exponential expression that also has that base but whose exponent is the difference of the exponents. If the bases are different, there is no simple way to divide the expressions.

**Example 2**

Simplify .  
(4)

**Raising a Power to a Power**

To raise an exponential expression to a power, keep the same base as in the original expression. Multiply the two exponents to find the new exponent.

**Example 3**

Simplify .

**Math Facts**

There are three main properties of exponents.

**Math Facts**

Any number (besides 0) raised to the 0 power is equal to 1. Any number (besides 0) raised to the negative power is equal to the reciprocal of that number raised to the positive version of that power.

**Math Facts**

To raise a base to a fractional power , take the *d*th root of the number and raise it to the *n*th power.

**Example 7**

What is the value of ?

**The Distributive Property for Exponents**

If an expression in parentheses is the product of numbers and/or variables, the entire expression in the parentheses can be raised to a power by raising each of the factors to that power and multiplying them together.

For example, cam be calculated by   
. This is also the solution if you simplified inside the parentheses first:   
. This property is needed when variables are involved.

**Example 9**

Simplify .

### Check Your Understanding of Section 3.1

1. Multiple-Choice
2. Simplify .  
   **(2)**
3. Simplify .  
   **(2)**
4. What is ?  
   **(2)**
5. What is ?  
   **(4)**
6. Simplify .  
   **(3)**
7. What is ?  
   **(1)**
8. What is ?

**(2) 1**

1. What is ?  
   **(3)**
2. What is   
   **(3) 49**
3. What is ?  
   **(2) 1**
4. *Show how you arrived at your answers*.
5. Ashlynn says that . Colin says that it is equal to Who is right and why?  
     
   Ashlynn is right because:
6. In 5th grade, Charles learned that   
   . Show how the properties of negative exponents justifies this answer.
7. If , how can you quickly calculate if your calculator does not have an exponent key?
8. If and , what is the value of ? Hint: change 1.5 into an improper fraction.)
9. What is the value of ?