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

# Chapter 8: Exponential Equations

## 8.1 Solving Exponential Equations

An exponential equation is one where the variable is an exponent. An example of a one-variable exponential equation is . Examples of two variable exponential equations are and   
.

**Finding Solutions to Exponential Equations**

In a two-variable equation like , substitute values for x, and find the corresponding y to get the solution. For example, if , then .

**Math Facts**

When a number other than 0 is raised to the 0 power, it becomes 1, not 0.

**Solving for the Exponent in an Exponential Equation**

In a one-variable exponential equation where the exponent is unknown, isolate the exponential expression and then use guess and check.

**Example**

Solve for the equation .  
The last step was done by guess and check.

### Check Your Understanding of Section 8.1

1. Multiple-Choice
2. If and , solve for y.  
   **(2) 9**
3. If and , solve for y.  
   **(3) 54**
4. If and , solve for y.  
   **(3) 1**
5. If and , solve for y.  
   **(4) 5**
6. If , and , solve for y.  
   **(3)**
7. If and , solve for x.  
   **(4) 3**
8. If and , solve for x.  
   **(1) 7**
9. If and , solve for x.  
   **(2) -3**
10. If and , solve for y.  
    **(4) 8**
11. If and , solve for y rounded to the nearest hundredth.  
    **(1) 2.70**
12. Show how you arrived at your answers.
13. Phoebe put $500 into the bank. The amount of money she has after t years is determined by the equation . After 4 years, how much money will Phoebe have in the bank.  
      
    Using Scientific Calculator:
14. The population of a town after t years can be approximated by the equation   
    . (a) According to the formula, what will the population of the town be after 10 years? (b) In what year will the population become 14,065?  
      
    (a)   
      
    (b) 15th year
15. Zoe drinks a cup of coffee that has 100 mg of caffeine. The amount of caffeine in the bloodstream after t hours can be determined by the equation . How much caffeine will be left in her bloodstream after 20 hours?
16. Food that is 110 degrees is put into a 30-degree freezer. The temperature of the food is related to the number of hours the food is in the freezer by the equation   
    . Between which two hours will the food be 32 degrees?  
      
    **Between 10 and 11 hours.**
17. Daphne says that is always greater than . Julia says that this is not true and that sometimes is greater than . Which student is correct? Explain.  
      
    Julia is correct.  
      
    For , will be greater than .

x 5^x 6^x  
 -1 0.20000 0.16667

-2 0.04000 0.02778

-3 0.00800 0.00463

-4 0.00160 0.00077

-5 0.00032 0.00013

-6 0.00006 0.00002

## 8.2 Graphing Solution Sets to Two-Variable Exponential Equations

The solution set to a two-variable exponential equation, like , can be produced with a table or with a graphing calculator. The shape of the graph is not a line or a parabola but is a distinctive shape that looks a bit like a playground slide.

A blue rectangle with black text

AI-generated content may be incorrect.

A graph with a line drawn on it

AI-generated content may be incorrect.

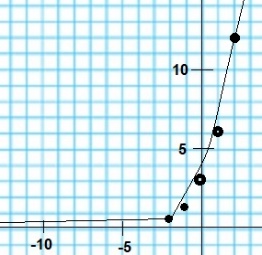
**Graphing the Solution Set to an Exponential Equation with a Table**

Five points are generally sufficient for graphing the solution set for an exponential equation. x-values of 2, 1, 0, -1, and -2 should produce enough points for an accurate graph.

**Example 1**

Make a table of solutions to , and use them to make a sketch of the graph of the solution set.

|  |  |
| --- | --- |
| x | y |
| 2 | 12 |
| 1 | 6 |
| 0 | 3 |
| -1 | 1.5 |
| -2 | 0.75 |



**Making Tables and Graphs on the Graphing Calculator**

**Example 2**

A blue rectangular object with black text

AI-generated content may be incorrect.

A graph with a line

AI-generated content may be incorrect.

**Math Facts**

In an exponential equation, the thing being raised to the power is called the *base*. When the base of an exponential equation is between 0 and 1, the graph shows exponential *decay*. When the base is greater than 1, the graph shows exponential *growth*.

### Check Your Understanding of Section 8.2

1. Multiple-Choice
2. Which ordered pair is in the solution set of ?  
   **(4) (4, 81)**
3. Which ordered pair is in the solution set of ?  
   **(3) (3, 40)**
4. What is the graph of   
   Points: (-1, 0.5), (0, 1), (2, 4), (3, 8)**(3)**
5. Which is the graph of ?  
   Points: (-1, 2), (0, 1), (1, 0.5), (2, 0.25)  
   **(1)**
6. Below is the graph of which equation?  
   Points (-1, 0.33), (0, 1), (1, 3), (2, 9)  
   **(4)**
7. Below is a graph of  
   Points: (-2, 9), (-1, 3), (0, 1), (1, 0.33)  
   **(1)**
8. The chart below has ordered pairs for which equation?

|  |  |
| --- | --- |
| x | y |
| 0 | 6 |
| 1 | 12 |
| 2 | 24 |
| 3 | 48 |

**(4)**

1. The chart below has ordered pairs for which equation?

|  |  |
| --- | --- |
| x | y |
| 0 | 6 |
| 1 | 3 |
| 2 | 1.5 |
| 3 | 0.75 |

**(2)**

1. In what interval is the graph of increasing?  
   **(1) Always**
2. Below is the graph of . What is true about the value of b?  
   **(2) b must be less than 1 and greater than 0.**
3. Show how you arrived at your answers.
4. The graph of passes through the point (5, 243). What must the value of b be?  
     
   **Answer: b = 3**

|  |  |
| --- | --- |
| x | y |
| 1 | 1 |
| 2 | 32 |
| 3 | 243 |

1. After putting $200 into the bank, the amount of money Xavier has after 5 years is . Make a graph showing how the money grows for 5 years.

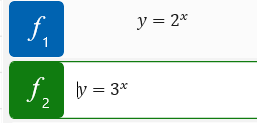
A graph with a line going up

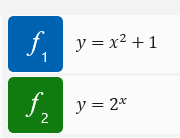
AI-generated content may be incorrect.

1. Below is the graph of and on the same set of axes.  
     
   A graph of a function

   AI-generated content may be incorrect.  
     
   Is it true that for all values of x? Explain.  
     
   **No. for x less than 0.**

|  |  |  |
| --- | --- | --- |
| x | 2^x | 3^x |
| -1 | 0.50000 | 0.33333 |
| -2 | 0.25000 | 0.11111 |
| -3 | 0.12500 | 0.03704 |
| -4 | 0.06250 | 0.01235 |

1. What is the solution to this system of equations?  
   **Answer: x = 0, y = 1**  
     
   A graph of a function

   AI-generated content may be incorrect.
2. Below are the graphs of and   
   . They both contain the point (0, 1). Is it true that for all values of ? Explain.  
     
     
   A graph of a function

   AI-generated content may be incorrect.

The graphs intersect at points (0, 1) and (1, 2).  
From x = 0 to 1, .  
From x > 1, .  
  
Note: Book answer says x > 4.3, which appears to be incorrect.