

## 1.2.2: Can You Solve This Mystery?

Date: \_\_\_\_\_

Recall: "To solve an equation" means to determine the value of the variable that makes the equation true.

**MYSTERY #1 – How can you solve exponential equations?**

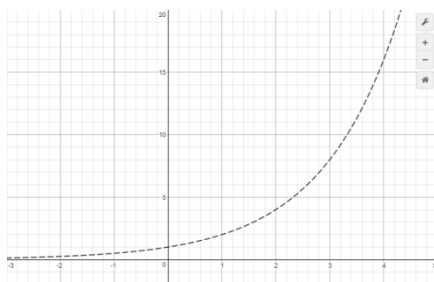
1. Solve these exponential equations. Match the solution with the equation.

Equation	Solution
_____ 1. $2^x = 8$	A. $x = -2$
_____ 2. $2^x = 16$	B. $x = 0$
_____ 3. $2^x = \frac{1}{4}$	C. $x = 3$
_____ 4. $2^x = 1$	D. $x = 4$

2. Describe the process that you used to solve the equations above.

3. Solve
- $2^x = 5$
- . Round your answer to the nearest hundredth.

4. Use
- desmos**
- to graph the function
- $y = 2^x$
- , using the settings below.

☒ X-Axis

$$-3 \leq x \leq 5$$

☒ Y-Axis

$$-2 \leq y \leq 20$$

5. Complete the following statements.

a) The value of the function is 16 when  $x =$  \_\_\_\_\_b) The value of the function is  $\frac{1}{4}$  when  $x =$  \_\_\_\_\_c) The value of the function is 8 when  $x =$  \_\_\_\_\_d) The value of the function is 5 when  $x =$  \_\_\_\_\_ (round your answer to two decimal places)



6. Explain how to use the graph of the function
- $y = 2^x$
- to solve the equations in #1.

7. Explain why you
- can not**
- use the graph of the function
- $y = 2^x$
- to solve the equation
- $2^{2x-3} = 8$
- but you
- can**
- use
- $y = 2^x$
- to solve the equation
- $2^x = 8$
- .

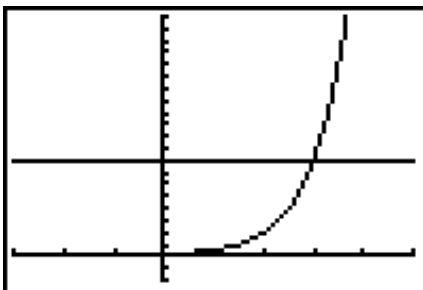
## MYSTERY #2 – How can you solve more difficult exponential equations?

8. Fear not! There is a way to solve the equation  $2^{2x-3} = 8$ .

Enter the left side of the equation as one function and the right side of the equation as another function.

	$y = 2^{2x-3}$
	$y = 8$

9. Label the functions as  $y = 2^{2x-3}$  and  $y = 8$  on the screen shot below.



$y =$  \_\_\_\_\_ (equation of curve)

$y =$  \_\_\_\_\_ (equation of line)

10. Find the point of intersection of the two functions and complete the following statements.

The point of intersection occurs when  $x =$  \_\_\_\_\_ and  $y =$  \_\_\_\_\_.

The solution to the equation is  $x =$  \_\_\_\_\_.

When  $x =$  \_\_\_\_\_, both functions have a value of \_\_\_\_\_.

## MYSTERY #3

11. Use [desmos](https://www.desmos.com/calculator) and the "Intersection Method" to solve the following equations. Record the solution.

Equation	$Y_1$	$Y_2$	Solution to Equation
a) $2^{2x-3} = 8$	$Y_1 = 2^{2x-3}$	$Y_2 = 8$	$x =$
b) $2^{2x-3} - 6 = 2$			
c) $2^{2x-3} + 5 = 13$			

12. Solve the mystery...Why are all of the solutions to these equations the same?

### MYSTERY #4

13. True or false (check one)? "The solution to any exponential equation is always an exact value."

☐ true or ☐ false Justify your choice.

14. Use trial and error on your calculator to determine the solution to the following equations. Compare your solution using the "Intersection Method".

Equation	Solution Using Trial And Error On <i>Your</i> Calculator (2 decimal places)	Solution Using The Intersection Method ( <u>3</u> decimal places)
a) $3.05^x = 15$	$x =$	$x =$
b) $2.3^x = 6$	$x =$	$x =$
c) $4.2^{-x} = 7$	$x =$	$x =$
d) $2.7^x = 38$	$x =$	$x =$

15. Make an exponential equation, with base 5, where the solution is

a) an exact value	b) 0.75
c) a negative integer	d) an irrational number (not exact)