Math 48B, Lesson 14: Exponential Functions

In Math 48B Lessons 14, 15, 16, 17, and 18, we study logarithmic functions:

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| --- | --- |
| Logarithmic Form | Exponential Form |
|  |  |

To begin our exploration, let’s recall the rules of powers/exponents.

1. WHAT IS AN INVERSE FUNCTION?

1A. What does it mean for a function to be one-to-one?

1B. What is the horizontal line test?

1C. What is an inverse function?

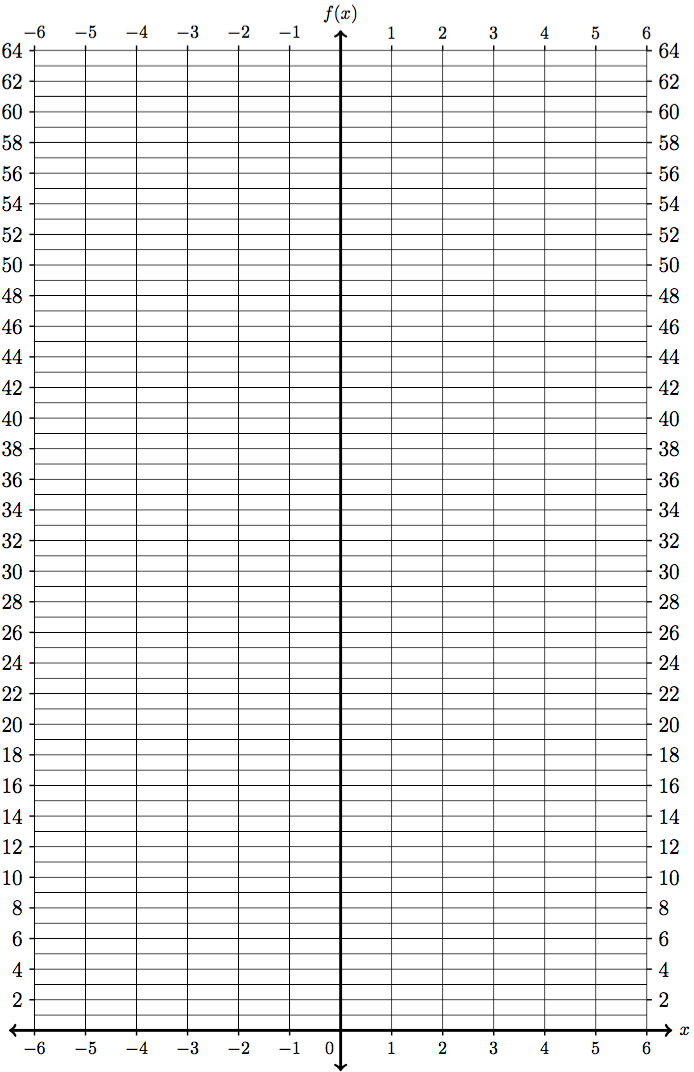
1D. When do inverse functions exist?

1E. Assume we start with function where every point on the graph of this function is given as . How do we create the graph of the inverse function?

1F. Explain inverse function notation .

2. WHAT IS THE INVERSE OF AN EXPONENTIAL FUNCTION?

2A. Graph of the exponential function below and then apply the horizontal line test to this function. What can you say about the existence of an inverse?



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2B. Graph the inverse of the exponential function below and then apply the horizontal line test to this function. What can you say about the existence of an inverse?

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**Chart, line chart

Description automatically generated**

2C. Write the input-output relation for the inverse function from Problem 2B above. Then, translate this relation into logarithmic form. Finally, develop a verbal description for logarithmic functions.

3. HOW TO MOVE BACK AND FORTH FROM LOGS INTO EXPONENTS?

Consider the two equivalent forms for logarithmic functions:

|  |  |
| --- | --- |
| Logarithmic Form | Exponential Form |
|  |  |

Write each of the following problems in both forms to find the desired output value.

3A. 3E.

3B. 3F.

3C. 3G.

3D. 3H.

4. WHAT ARE PROPERTIES OF LOGARITHMS?

Consider the two equivalent forms for logarithmic functions:

|  |  |
| --- | --- |
| Logarithmic Form | Exponential Form |
|  |  |

Using these two equivalent forms, come up with formula to describe the properties of logarithmic functions in each of the following cases.

4A.

4B.

4C.

4D.

5. WHAT DOES THE GRAPH OF A LOGARITHM LOOK LIKE?

Fill out the table for the logarithmic function below. The, use Desmos.com to create a graph and describe the relevant features of that graph including the domain, range, x-intercept, and the end behavior as .

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6. HOW TO EVALUATE LOGARITHMS?

Consider the two equivalent forms for logarithmic functions:

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| --- | --- |
| Logarithmic Form | Exponential Form |
|  |  |

Use these two equivalent forms to evaluate each of the following logarithms.

6A. 6E.

6B. 6F.

6C.

6D.