**Testing Exponential Functions**

Name:

Unit 8 Day 3

Students can:

* Target #5: Discover that exponential functions grow by equal factors over equal intervals.
* Target #6: Classify situations as linear or exponential based on the change between intervals (linear functions change by equal differences and exponential functions change by equal factors

|  |  |
| --- | --- |
| x | y |
| 2 |  |
| 4 |  |
| 5 |  |
| 7 |  |
| 8 |  |
| 10 |  |

**WARM-UP:**

Let’s look at the function $f(x)=.25●2^{x}$

Fill in the table with the missing y values.

**MINI LESSON:**

We are going to be looking at the intervals from 2 to 4 and from 5 to 7.

Use the function and from the warm-up to fill in the next table.

|  |  |  |  |
| --- | --- | --- | --- |
| Interval | Interval Length (difference of two x- values) | Growth (difference of two y-values.) | Growth Factor |
| 2 to 4 |  |  |  |
| 5 to 7 |  |  |  |
| 8 to 10 |  |  |  |

So, if we have several cases of equal intervals for our x-values, our growth factor is always \_\_\_\_\_\_\_.

This means that exponential functions grow by \_\_\_\_\_\_\_\_\_\_\_ factors over \_\_\_\_\_\_\_\_\_\_\_ intervals.

|  |  |
| --- | --- |
| x | y |
| 1 |  |
| 4 |  |
| 5 |  |
| 8 |  |
| 9 |  |
| 12 |  |

Let’s try this for one more function using different interval lengths.

 Fill in the table with the missing values for the function $f(x)=2●2^{x}$.

|  |  |  |  |
| --- | --- | --- | --- |
| Interval | Interval Length (difference of two x- values) | Growth (difference of two y-values.) | Growth Factor |
| 1 to 4 |  |  |  |
| 5 to 8 |  |  |  |
| 9 to 12 |  |  |  |

Again, we have equal intervals for x and our growth factors are \_\_\_\_\_\_\_\_\_\_.

|  |  |
| --- | --- |
| x | y |
| 1 |  |
| 4 |  |
| 5 |  |
| 8 |  |
| 9 |  |
| 12 |  |

What would the growth look like for a linear function?

Fill in the tables for the function $f\left(x\right)=2x+2$

|  |  |  |  |
| --- | --- | --- | --- |
| Interval | Interval Length (difference of two x- values) | Growth (difference of two y-values.) | Rate of change |
| 1 to 4 |  |  |  |
| 5 to 8 |  |  |  |
| 9 to 12 |  |  |  |

Now that we know that exponential functions grow by equal factors over equal intervals, and linear functions grow not by a factor, but by a constant rate of change, we should be able to look at a table of values and know if it represents an exponential function.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | 0 | 1 | 2 | 3 |
| **y** | 5 | 10 | 15 | 20 |

1. 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | 0 | 1 | 2 | 3 |
| **y** | 3 | 9 | 27 | 81 |

**Workshop**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | –1 | 1 | 3 | 5 |
| **y** | 32 | 16 | 8 | 4 |

Determine whether the following functions are exponential or linear.
1. 2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | –1 | 0 | 1 | 2 | 3 |
| **y** | 3 | 3 | 3 | 3 | 3 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **x** | –5 | 0 | 5 | 10 |
| **y** | 1 | 0.5 | 0.25 | 0.125 |

3. 4.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | 0 | 1 | 2 | 3 | 4 |
| **y** | $\frac{1}{3}$  | $\frac{1}{9}$  | $\frac{1}{27}$  | $\frac{1}{81}$  | $\frac{1}{243}$  |