Math 1 **7.6 Exponential Functions** Unit 4

*SWBAT graph exponential functions and determine all vertical shifts.*

**Introduction to Exponential Functions**

Nyasia has been hired by a company that pays her 2 cents on the first day and then doubles her pay each day after the first.

1. Complete the chart to determine how much Nyasia makes, in cents, each day.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Day** | 1 | 2 | 3 | 4 | 5 | 6 | 10 | 30 | 50 |
| **Pay** |  |  |  |  |  |  |  |  |  |

1. Write a formula to calculate the pay, p, as a function of day, d.

This is an example of an **exponential function** since the independent variable (days) is the **exponent**. Notice how fast the values of the pay are increasing. This is what is known as exponential growth.

**Rules of Exponential Functions**

Exponential Form: $y=a(b)^{x}+k$

a = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Exponential Growth Exponential Decay



b = Growth or Decay factor

* Growth:
* Decay:

Key Point (y-intercept):

**Graphing**

1. Consider the function y = 2x
2. Consider the function y = (1/2)x

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

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

How do the two graphs compare to each other? What differences do you notice?

**Graphing Vertical Shifts**: All exponentials run through the point (0, 1) unless they have been vertically shifted.

1. Graph the function f(x) = 2x + 3

Asymptote: \_\_\_\_\_\_\_\_\_\_\_\_\_

1. Graph the function f(x) = 2x – 4

 Asymptote: \_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| **x** | **y** |
| -1 |  |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

|  |  |
| --- | --- |
| **x** | **y** |
| -1 |  |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

**Vertical Shift EOC-Type Questions (non-calculator)**

1. The function f(x) = 4x was replaced with

f(x) + k, resulting in the function graphed to the right. What is the value of k?

1. The function f(x) = 3x was replaced with

f(x) + k, resulting in the function graphed to the right. What is the value of k?

**Determining Whether a Function is Exponential**

Does the table or rule represent an exponential function? Explain.

1. 
2. 
3. $y=3x^{2}$
4. $y=3∙6^{x}$

**Evaluating an Exponential Function**

Suppose 30 flour beetles are left undisturbed in a warehouse bin. The beetle population doubles each week. The function f(x) = 30(2)x give the population after x weeks. How many beetles will there be after 56 days?

An initial population of 20 rabbits triples every half year. The function f(x) = 20(3)x gives the population after x half-year periods. How many rabbits will there be after 3 years?