Assignments for Algebra 2
Unit 11: Exponential Functions

Day 1 – Graph Exponential Growth Functions

Objectives: SWBAT graph exponential growth functions

Exponential function– a function where a constant is risen to a power of x or $f(x) = b^x$

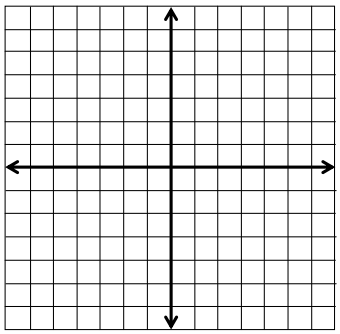
Exponential growth function– Where a value increases in proportion to its current value. Such as always doubling, tripling, etc. $b > 1$

Growth factor – the b value of $f(x) = b^x$

Asymptote – a line the graph approaches

PARENT FUNCTION FOR EXPONENTIAL GROWTH FUNCTIONS

$y = b^x$ Given that $b > 1$ For this graph we will use $b = 3$.



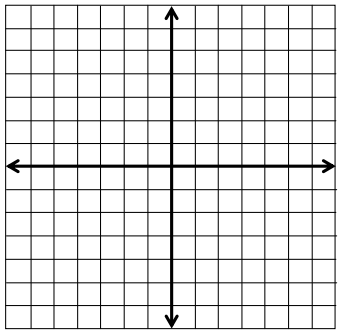
- Notice that the graph _____ from left to right, and passes through the points _____ and _____.
- The x-axis is an _____ of the graph, and could be shifted up or down by a factor of _____.
- The domain of the parent function is _____.
- The range of the parent function is _____ .
- The transformation equation of an exponential growth function is $y = a \cdot b^{x-h} + k$

Steps to graphing an exponential function.

- Identify the parent function.
- Find your three crucial points, by using $x = 0, x = 1$, and $x = -1$.
- Translate the crucial points if needed (h, k, and a).
- Sketch the exponential growth function.

Graph the following exponential functions, then state the domain and range.

1. $y = 2^x$



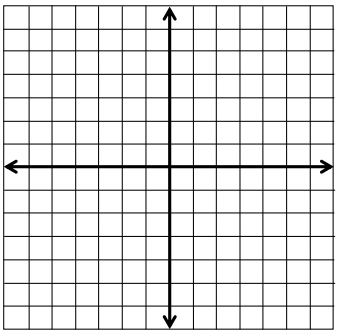
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

2. $f(x) = 4^x$



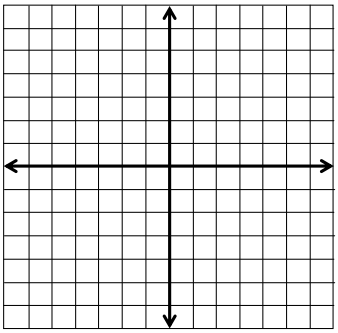
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

3. $y = 3 \bullet 2^x$



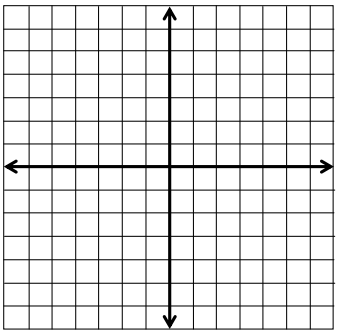
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

4. $f(x) = -\frac{1}{2} \bullet 4^x$



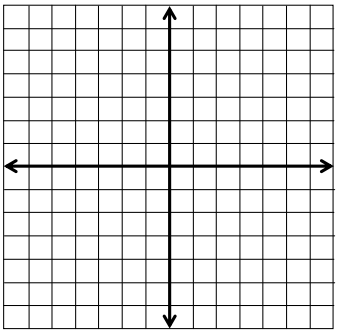
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

5. $g(x) = 2^{x-3} + 1$



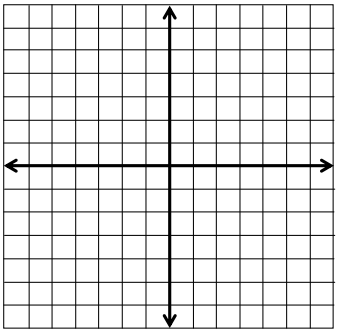
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

6. $y = 4^{x+1} - 3$



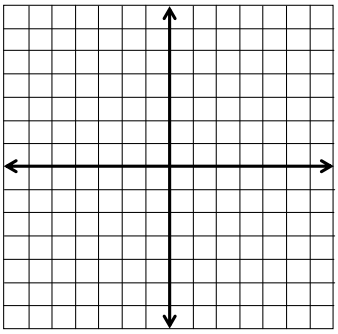
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

7. $f(x) = 4 \bullet 2^{x-1} - 2$



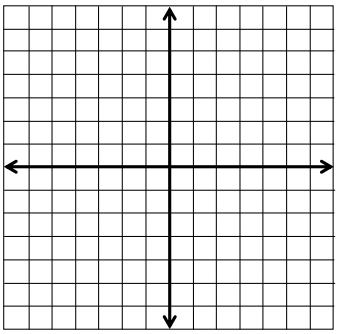
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

8. $h(x) = -2 \bullet 4^{x-4} + 5$



Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

Day 2 – Graph Exponential Decay Functions

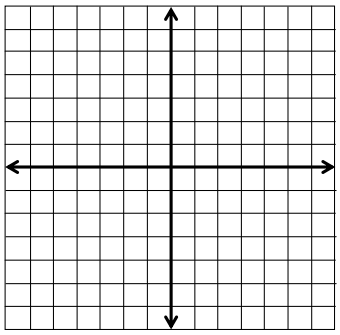
Objectives: SWBAT graph exponential decay functions

Exponential decayfunction– Where a value decreases in proportion to its current value. Such as always doubling, tripling, etc. $0 < b < 1$

Growth factor – the b value of $f(x) = b^x$

PARENT FUNCTION FOR EXPONENTIAL DECAY FUNCTIONS

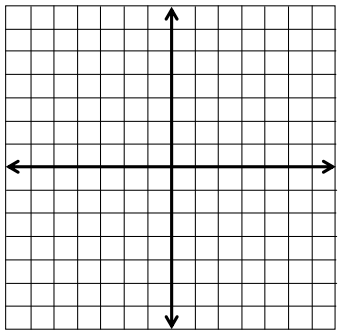
$y = b^x$ Given that $0 < b < 1$ For this graph we will use $b = \frac{3}{4}$.



- Notice that the graph _____ from left to right, and passes through the points _____ and _____.
- The *x*-axis is an _____ of the graph, and could be shifted up or down by a factor of _____.
- The domain of the parent function is _____.
- The range of the parent function is _____ .
- The transformation equation of an exponential growth function is $y = a \cdot b^{x-h} + k$

Graph the following exponential functions, then state the domain and range.

1. $y = \left(\frac{1}{2}\right)^x$



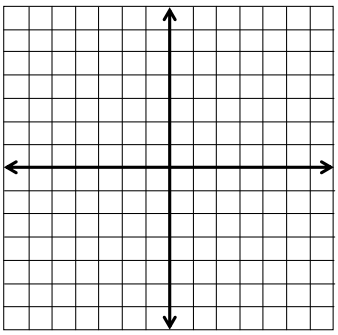
Domain:

Range:

Asym:

(−1, _____ **) (0,** _____ **) (1,** _____**)**

2. $f(x) = \left(\frac{1}{4}\right)^x$



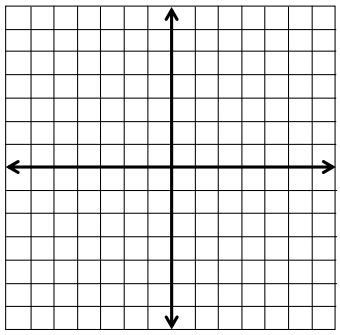
Domain:

Range:

Asym:

(−1, _____ **) (0,** _____ **) (1,** _____**)**

3. $y = 4 \bullet \left(\frac{1}{2}\right)^x$



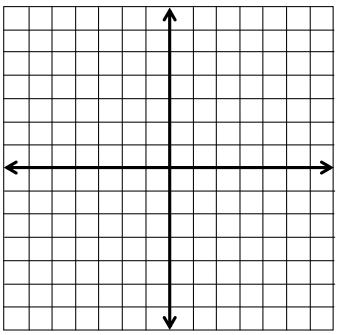
Domain:

Range:

Asym:

(−1, _____ **) (0,** _____ **) (1,** _____**)**

4. $f(x) = \left(\frac{3}{5}\right)^{x-2} + 2$



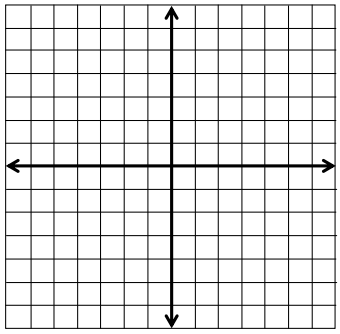
Domain:

Range:

Asym:

(−1, _____ **) (0,** _____ **) (1,** _____**)**

5. $g(x) = -2\left(\frac{1}{2}\right)^{x+3} - 1$



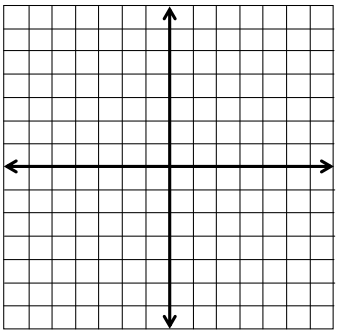
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

6. $h(x) = 3\left(\frac{2}{3}\right)^{x+1} - 3$



Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

Day 3 – Application of Exponential Growth and Decay Functions

GENERAL GROWTH FORMULAL: $A = P(1 + r)^t$

1. Mr. Mortara has a 100 gallon fish tank at home full of guppies. Over the last 7 years, an initial population of 38 guppies has grown by about 7% per year. Write an exponential growth model to help determine how many guppies are currently living in the tank?

2. If this growth rate continues, use the table/graph to help determine when Mr. Mortara's tank will have a population of 92 guppies.

COMPOUND INTEREST FORMULA: $A = P\left(1 + \frac{r}{n}\right)^{nt}$

3. Jenny, being fiscally aware, knows that saving money early can produce decent returns. So she decides to place $5000 into a savings account that pays 4.3% annual interest. Find the balance of her account after 20 years, assuming that the interest is compounded quarterly. What about if she waits 45 years? 75 years?

4. Nedal, after reading this last example, thinks that this sounds like a pretty good idea. So he does a bit of research and invests $10,000 in a mutual fund that pays 6.1% annually, how much does Nedal have after 25 years if the interest is compounded monthly? 50 years?

GENERAL DECAY FORMULAL: $A = P(1 - r)^t$

5. A new television costs $1200. The value of the television decreases by 21% each year. Write an exponential decay model giving the value (in dollars) of the television after t years.

6. Estimate the value of the television after 2 years.

7. Use the graph to estimate when the value of the television will be $300.

Day 4 – Use Functions Involving e

Objectives: SWBAT Simplify and graph expressions with "e"

Natural base "e" or Euler's Number: e ≈ _____

Simplify the natural base expressions.

1. $e^6 \bullet e^3$

2. $\frac{18e^6}{2e^4}$

3. $\left(4e^{3x}\right)^2$

4. $e^5 \bullet e^{-9}$

5. $\frac{\left(4e^3\right)^2}{8e^5}$

Use a calculator to evaluate the expression. Always round to 3 decimals.

6. e^{-2}

7. $e^{0.3}$

8. $e^{-0.65}$

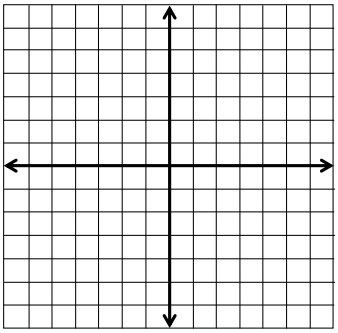
NATURAL BASE FUNCTIONS

A function in the form of $y = ae^{rt}$ is called a natural base exponential function.

- If a > 0 and r > 0, then the function is an exponential _____ function.
- If a > 0 and r < 0, then the function is an exponential _____ function.

Graph the following natural base functions, then state the domain and range.

9. $y = 2e^{x}$



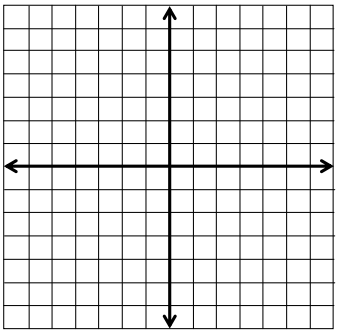
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

10. $y = 3e^{-0.7x}$



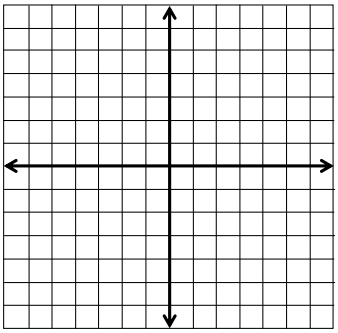
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

11. $y = e^{(x-3)} + 2$



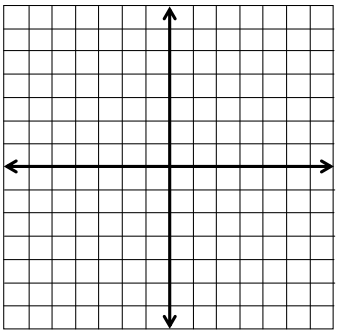
Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

12. $f(x) = e^{-0.35(x+1)} - 2$



Domain:

Range:

Asym:

$(-1,$ _____ $)$ $(0,$ _____ $)$ $(1,$ _____ $)$

Day 5 – Application of Continuous Exponential Growth and Decay Functions

Objectives: SWBAT Solve equations with "*e*"

COMPOUND CONTINUOUS FORMULA: $A = Pe^{rt}$

1. You deposit $3500 in an account that pays 4% annual interest compounded continuously. What is the balance after 1 year?

2. You deposit $4800 in an account that pays 6.5% annual interest compounded continuously. What is the balance after 3 years?

3. Billy, being fiscally aware, knows that saving money early can produce decent returns. So he decides to place $5000 into a savings account that pays 4.3% annual interest. Find the balance of his account after 20 years, assuming that the interest is compounded quarterly. What about if he waits 45 years?