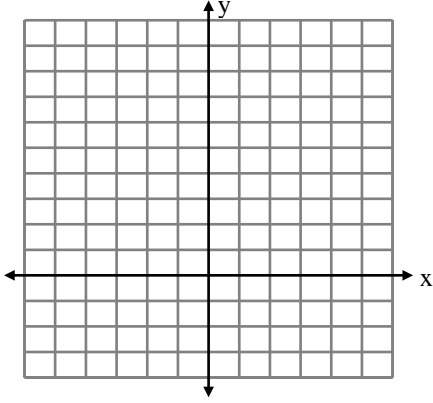


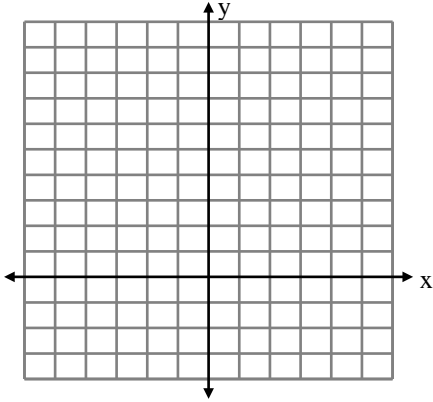
Section 3.1 – Exponential Functions

CONCEPT ONE: Graphing exponential functions.

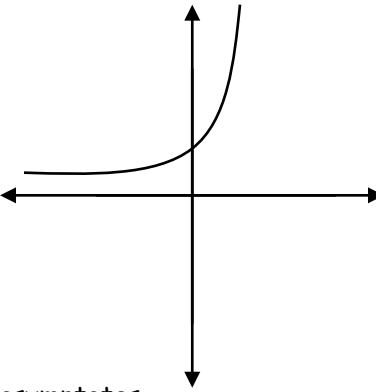
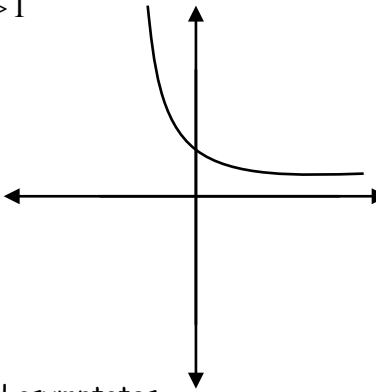
Example 1: Graph the following functions on the grid provided. Then answer the questions.

| | | |
|--|---|--|
| <p>a. $y = 2^x$ b. $y = 3^x$ c. $y = 4^x$</p> |  | <p>A. What happens to the graph as the base increases?</p> <p>B. What is the y-intercept for each function? WHY?</p> <p>C. What are the x-intercepts? WHY?</p> <p>D. What is the domain of each function? What is the range?</p> <p>E. Are the functions increasing or decreasing? One-to-one?</p> |
|--|---|--|

Example 2: Graph the following functions on the grid provided. Then answer the questions.

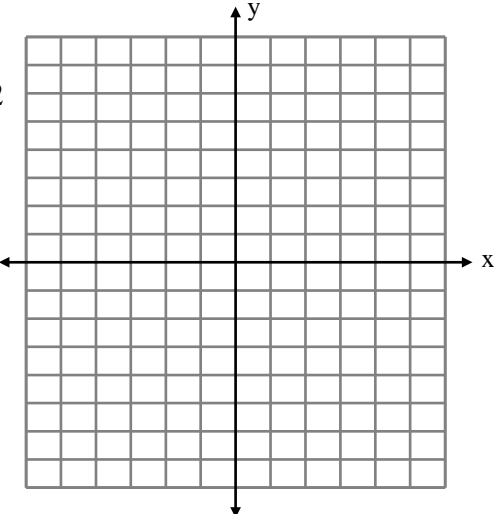
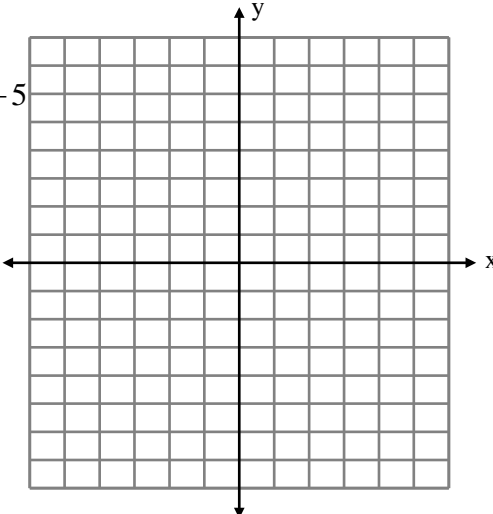
| | | |
|--|--|--|
| <p>a. $y = 2^{-x}$ b. $y = 3^{-x}$ c. $y = \frac{1}{4^x}$</p> |  | <p>A. What happens to the graph as the base increases?</p> <p>B. What is the y-intercept for each function? WHY?</p> <p>C. What are the x-intercepts? WHY?</p> <p>D. What is the domain of each function? What is the range?</p> <p>E. Are the functions increasing or decreasing? One-to-one?</p> |
|--|--|--|

GENERALIZATIONS FOR EXPONENTIAL FUNCTIONS:

| | |
|---|--|
| <p>Graph of $y = a^x, a > 1$</p>  <p>Domain: $(-\infty, \infty)$ Range: $(0, \infty)$ Intercept: $(0, 1)$ Increasing x-axis is a horizontal asymptotes $(a^x \rightarrow 0 \text{ as } x \rightarrow -\infty)$ Continuous</p> | <p>Graph of $y = a^{-x}, a > 1$</p>  <p>Domain: $(-\infty, \infty)$ Range: $(0, \infty)$ Intercept: $(0, 1)$ Decreasing x-axis is a horizontal asymptotes $(a^{-x} \rightarrow 0 \text{ as } x \rightarrow \infty)$ Continuous</p> |
|---|--|

CONCEPT TWO: Transformations of Exponential Functions.

Example 3: Graph the following functions on the grid provided.

| | |
|---|---|
| <p>a. $y = -2^x$ b. $y = 2^{x+2}$ c. $y = 2^x + 2$</p>  | <p>d. $y = -3^{-x}$ e. $y = 3^{x-1}$ f. $y = 3^{x+4} - 5$</p>  |
|---|---|

GENERALIZATIONS FOR TRANSFORMATIONS

| | |
|--|--|
| Horizontal Shift $y = a^x$ to $y = a^{x+c}$ | Vertical Shift $y = a^x$ to $y = a^x + c$ |
| Reflection in x -axis $y = a^x$ to $y = -a^x$ | Reflection in y -axis $y = a^x$ to $y = a^{-x}$ |

CONCEPT THREE: Using the One-to-One Property to solve equations.

Example 4: Solve for x .

| | |
|---|--|
| <p>a. $9 = 3^{x+1}$</p> | <p>b. $8^{x-3} = 4^{x+1}$</p> |
| <p>c. $5^{x+3} = \sqrt{125}$</p> | <p>d. $\left(\frac{1}{2}\right)^{x^2} = 8^{3x+6}$</p> |