Chunmei Zhu – CUNY Assessment Test Lesson Plan Sample

Objectives

Students will do the following:

- Learn the exponential function and its properties
- Calculate the exponential functions
- Sketch graphs and analyst the properties of exponential function

Materials

The class will need the following:
College-Level Mathematics: Exponential function.
http://www2.cuny.edu/academics/testing/test-preparation-resources/

Procedures

1. Explain to students that the properties of exponential function, the difference of exponential function a power function.
   *Definition*: In a power function the independent variable (x) is raised to a (constant) power (c), $y = x^c$. In an exponential function the independent variable (x) is the exponent while the base (b) is a constant, $y = b^x$. A more general formula is $y = ab^{x+k} + h$, where a,k,h are real numbers.

   Properties: $y = b^x$:
   - The graph of $f(x)$ will always contain the point (0,1). Or $f(0) = 1$ regardless of the value of b.
   - For every possible b $b^x > 0$. Note that this implies that $b^x \neq 0$.
   - If $0 < b^x < 1$ then the graph of b^x will decrease as we move from left to right. Check out the graph of $\left(\frac{1}{2}\right)^x$ below for verification of this property.
   - If $b > 1$ then the graph of b^x will increase as we move from left to right. Check out the graph of 2^x below for verification of this property.
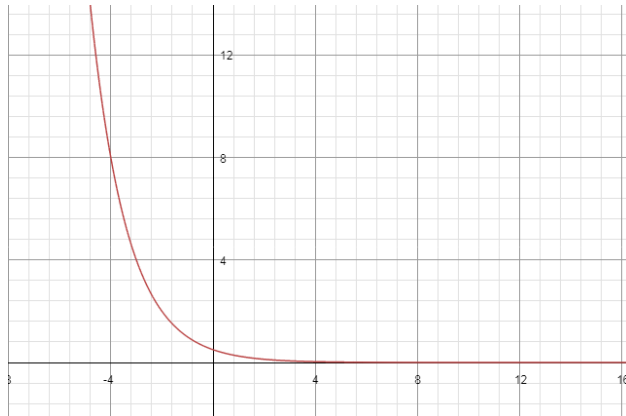   - If $b^x = b^y$ then x=y.

2. Show how to calculation three functions and sketch the graph :
   $y = 2^x$ -8
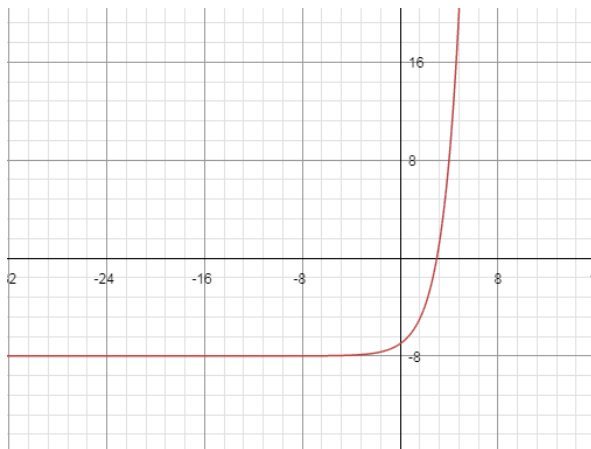
1. x domain : x is a real number (-∞, +∞)
2. y domain : y is a real number (-8, +∞)
3. the interceptor on x-axes: (3,0)
4. the interceptor of y-axes: (0,-7)
5. What is the graph look like: y increasing while x increasing -> increasing curve

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

1. x domain : x is a real number (-∞, +∞)
2. y domain : y is a real number (0, +∞)
3. the interceptor on x-axes: y>0, no intercept on x-axes
4. the interceptor of y-axes: (0,0.5)
5. What is the graph look like: y decreasing while x increasing -> decreasing curve above x-axes
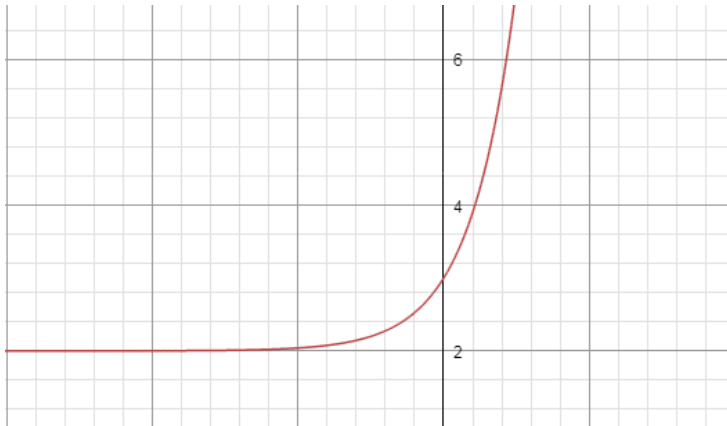
$$y = 2e^x - 10 \quad (where\ e \approx 2.71828)$$
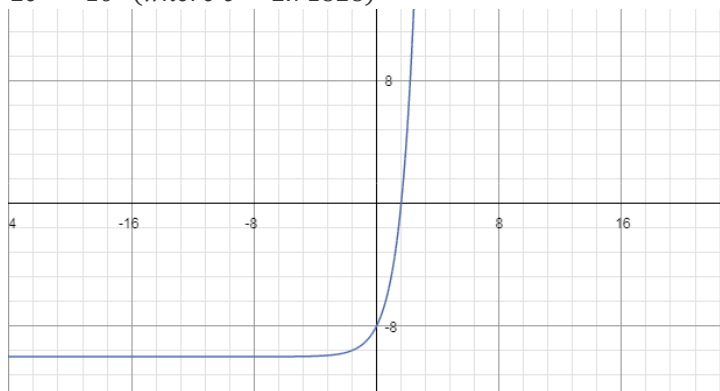
1. x domain : x is a real number (-∞, +∞)
2. y domain : y is a real number (-10, +∞)
3. the interceptor on x-axes: (1.60944,0)
4. the interceptor of y-axes: (0,-8)
5. What is the graph look like: y increasing while x increasing -> increasing curve
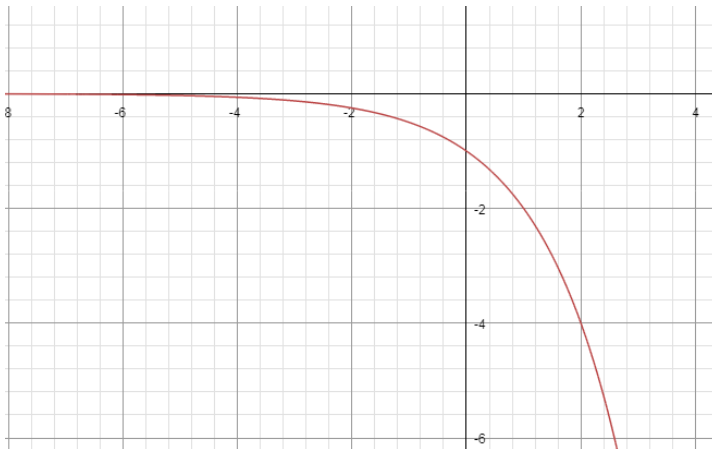
Practical Questions

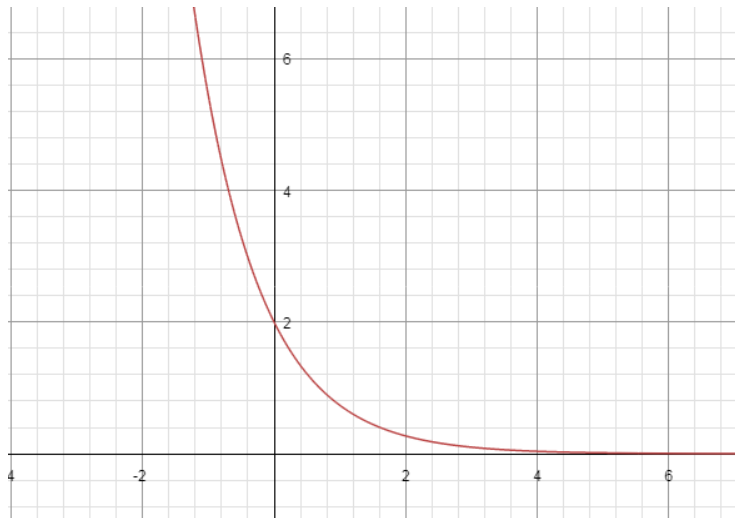**Q1.** $Graph\ y = 5^x + 2$, and answer the question in discussion section

1. x domain : x is a real number (-∞, +∞)
2. y domain : y is a real number (2, +∞)
3. the interceptor on x-axes: y>0, no intercept on x-axes
4. the interceptor of y-axes: (0,3)
5. What is the graph look like: y increasing while x increasing -> increasing curve and above x=2

**Q2.** $Graph\ y = -2^x$, and answer the question in discussion section

1. x domain : x is a real number (-∞, +∞)
2. y domain : y is a real number (-∞, 0)
3. the interceptor on x-axes: y<0, no intercept on x-axes
4. the interceptor of y-axes: (0,-1)
5. What is the graph look like: : y decreasing while x increasing -> decreasing curve below x-axes

Q3. $Graph\ y = 2/(e^x)$, and answer the question in discussion section

1. x domain : x is a real number (-∞, +∞)
2. y domain : y is a real number (0, +∞)
3. the interceptor on x-axes: y>0, no intercept on x-axes
4. the interceptor of y-axes: (0,2)
5. What is the graph look like: : y decreasing while x increasing -> decreasing curve above x-axes

Q4. $Graph\ y = 3(2^{x-1}) + 4$, and answer the question in discussion section
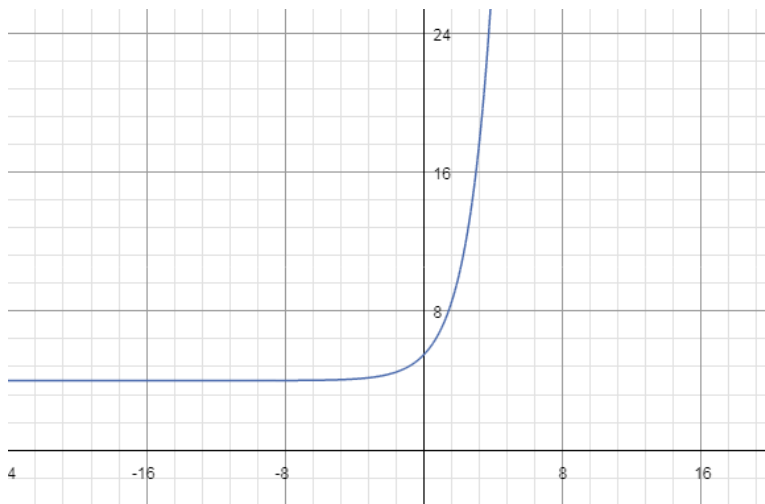
1. x domain : x is a real number (-∞, +∞)
2. y domain : y is a real number (0, +∞)
3. the interceptor on x-axes: y>4, no intercept on x-axes
4. the interceptor of y-axes: (0,5.5)
5. What is the graph look like: : y decreasing while x increasing -> decreasing curve above x=4

Discussion

1. What is the domain of the independent variable (x)?
2. What is the domain of the dependent variable (y)?
3. What is the interceptor on x-axes?
4. What is the interceptor on y-axes?
5. What is the graph look like?

Evaluation

- Each answer in discussion : 1 point (x5)
- Sketch a graph: 2 points
- Each problem has 7 points in total

Extensions

Tips for sketching a two-dimension graph for a function:
- Analyst the character of the function: input and output domain, central point,
- List the value of the independent-single variable
- Use calculator to computer the dependent variable
- Plot the points in a graph
- Connect the points
- Descript the graph – the relationship of independent variable and dependent variable, center point

Suggested Readings

Resources of CUNY Assessment Test in Math
http://www2.cuny.edu/academics/testing/test-preparation-resources/

Vocabulary

Power
Base
Domain
Independent variable x
Dependent variable y
Curve in a two-dimension graph
Interception point