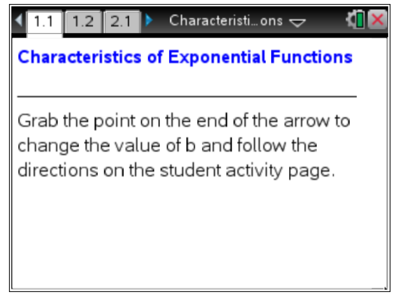
Characteristics of Exponential Functions

Name _______________

Student Activity

Class _______________



Open the TI-Nspire™ document *Characteristics_of_Exponential_Functions.tns*.

How does the graph of $f(x) = 2^x$ compare to the graph of $f(x) = 5^x$? What characteristics do they have in common? How are they different? In this activity, you will explore the characteristics of these and other exponential functions.

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1. a. Describe some characteristics of the graph $f(x) = 2^x$, including the domain and range.

   b. Grab and move the point to increase the value of b. What happens to the graph as b increases? Do any of the characteristics you described stay the same? What changes?

2. a. Why do the graphs of $f(x) = 3^x$ and $f(x) = 5^x$ both pass through the point (0, 1)?

   b. Would it ever be possible to have a graph of the form $f(x) = b^x$ that does not pass through the point (0, 1)? Why or why not?

3. Why is the graph of $f(x) = b^x$ a horizontal line when $b = 1$? Justify.

4. Predict what will happen to the graph of $f(x) = b^x$ when the value of b is between 0 and 1 ($0 < b < 1$).

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5. a. Test your prediction from question 4. Describe the characteristics of the graph of $f(x) = b^x$ when b is between 0 and 1.

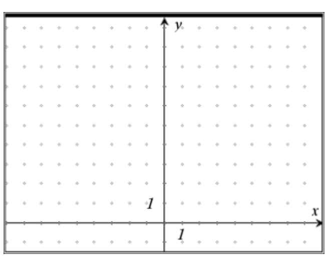
   b. Explain any differences between this graph and the graph of $f(x) = b^x$ when b is greater than 1.

6. a. Eric noticed that the graph of $f(x) = b^x$ increases when b is greater than 1 ($b > 1$), and the graph of $f(x) = b^x$ decreases when b is between 0 and 1 ($0 < b < 1$). How could he mathematically justify this?

   b. Cheryl wondered when $f(x) = b^x$ would equal 0. Use the TI-Nspire document on your handheld to investigate. What would you say to Cheryl?

7. For each function below, sketch the graph. Identify the domain, range, y-intercept, and at least one other point on the graph.

a. $f(x) = 10^x$



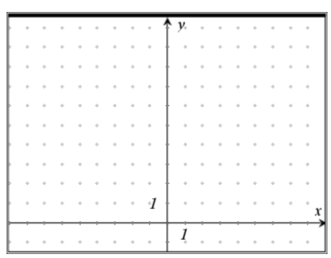
D: ____________________

R: ____________________

y-intercept: ___________

another point: _________

b. $f(x) = (0.1)^x$



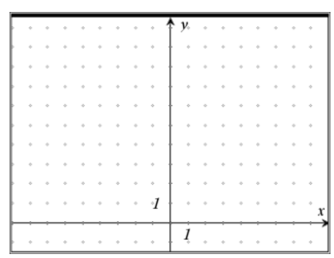
D: ____________________

R: ____________________

y-intercept: ___________

another point: _________

c. $f(x) = (1)^x$



D: ____________________

R: ____________________

y-intercept: __________

another point: ________

