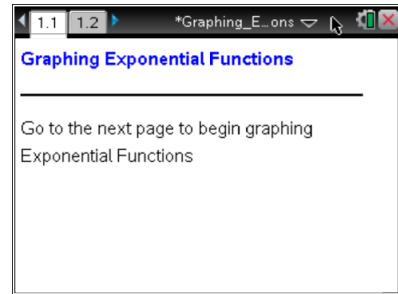# Graphing Exponential Functions
Student Activity

Name _____

Class _____

Open the TI-Nspire document
Graphing_Exponential_Functions.tns.

This activity explores the family of exponential functions, $f(x) = b^x$ where $b > 0$ and $b \neq 1$. You will investigate the graphs of exponential functions and examine general characteristics such as end behavior, domain, and range.

Move to page 1.2.

1. Explore several different **b**-*values* by dragging the slider.
    a. Set **b** = 1. Describe the graph.

    b. By definition, for the exponential function $f(x) = b^x$, *b* cannot equal 1. What mathematical reason can you give for this restriction?

    c. Set **b** = 0. Describe the graph.

    d. By definition, for the exponential function $f(x) = b^x$, **b** cannot equal 0. What mathematical reason can you give for this restriction?

2. Explore several different **b**-*values* by dragging the slider.
    a. For what **b**-values is the function increasing? Why is this true?

    b. For what **b**-values is the function decreasing? Why is this true?

3. Explore several different **b**-*values* by dragging the slider.
    a. For each **b** -value, identify the *y*-intercept of the function. Interpret your results.

    b. When **b** > 0, why is there no *x*-intercept?

c. Another special point is when $x = 1$. Describe the general point regardless of the value of **b**. Explain your answer.

4. Drag the slider to explore several different *b*-values where **b** > 1.
    a. What does $f(x)$ approach as *x* approaches ∞? Explain.

    b. What does $f(x)$ approach as *x* approaches $-\infty$? Explain.

    c. What is the equation of the horizontal asymptote?

5. Drag the slider to explore several different **b**-*values* where $0 < $ **b** $ < 1$.
    a. What does $f(x)$ approach as *x* approaches $-\infty$? Explain.

    b. What does $f(x)$ approach as *x* approaches ∞? Explain.

    c. What is the equation of the horizontal asymptote?

6. Find the domain and range for the family of exponential functions $f(x) = b^x$ where **b** > 0 and **b** ≠ 1.

7. Wade believes the function $f(x) = b^x$ will eventually intersect the *x*-axis. Is he correct? Why or why not?

8. Eric believes that for b>1, the function $f(x) = b^x$ increases on only one side of the *y*-axis. Is he correct? Why or why not?