

## Graphing Exponential Functions Guided Notes

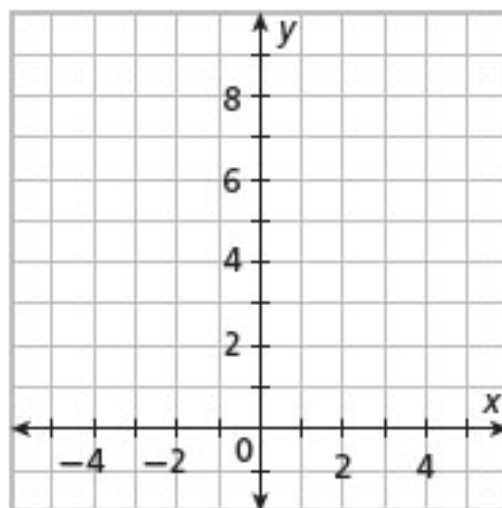
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Your goal today is to determine the characteristics of the graphs of exponential functions. In an **exponential function**, the variable is an exponent. The parent function is  $f(x) = b^x$  where  $b$  is any real number greater than 0, except 1.

**1 EXAMPLE** Graphing  $f(x) = b^x$  for  $b > 1$ 

Graph  $f(x) = 2^x$ . Complete the table below. Graph the points and connect with a smooth curve.

| $x$ | $f(x) = 2^x$                           |
|-----|--|
| -3  | $2^{-3} = \frac{1}{2^3} = \frac{1}{8}$ |
| -2  | <input type="text"/>                   |
| -1  | <input type="text"/>                   |
| 0   | <input type="text"/>                   |
| 1   | <input type="text"/>                   |
| 2   | <input type="text"/>                   |
| 3   | <input type="text"/>                   |

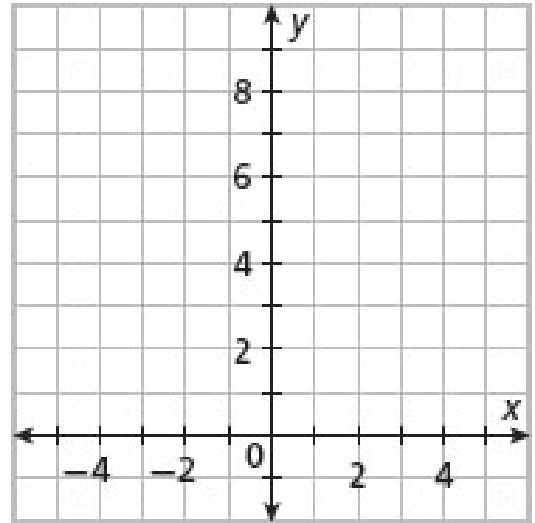


1. What happens to  $f(x)$  as  $x$  increases? What happens to  $f(x)$  as  $x$  decreases?
2. Does the graph intersect the  $x$ -axis? Explain how you know.
3. What are the domain and range of  $f(x)$ ?
4. In an exponential function,  $f(x) = b^x$ ,  $b$  is not allowed to be 1. Explain why this restriction exists.

**2 EXAMPLE** Graphing  $f(x) = b^x$  for  $0 < b < 1$

Graph  $f(x) = \left(\frac{1}{2}\right)^x$ . Complete the table below. Graph the points and connect with a smooth curve.

| $x$ | $f(x) = \left(\frac{1}{2}\right)^x$         |
|-----|---|
| -3  | $\left(\frac{1}{2}\right)^{-3} = (2)^3 = 8$ |
| -2  |   |
| -1  |   |
| 0   |   |
| 1   |   |
| 2   |   |
| 3   |   |



- What happens to  $f(x)$  as  $x$  increases? What happens to  $f(x)$  as  $x$  decreases?
- How does the domain and range of  $f(x) = \left(\frac{1}{2}\right)^x$  compare to the domain and range of  $f(x) = 2^x$ ?
- What do you notice about the y-intercepts of the graphs of  $f(x) = \left(\frac{1}{2}\right)^x$  and  $f(x) = 2^x$ ? Why does this make sense?
- The graph of an exponential function,  $f(x) = b^x$ , is shown. Which of the labeled points,  $(0, 1)$  or  $(1, 5)$ , allows you to determine the value of  $b$ ? Why doesn't the other point help?

a. What is the value of  $b$ ? Explain how you know?

