## Lesson 12: Reasoning about Exponential Graphs (Part 1)

Let’s study and compare equations and graphs of exponential functions.

### 12.1: Spending Gift Money

Jada received a gift of $180. In the first week, she spent a third of the gift money. She continues spending a third of what is left each week thereafter. Which equation best represents the amount of gift money , in dollars, she has after weeks? Be prepared to explain your reasoning.

### 12.2: Equations and Their Graphs

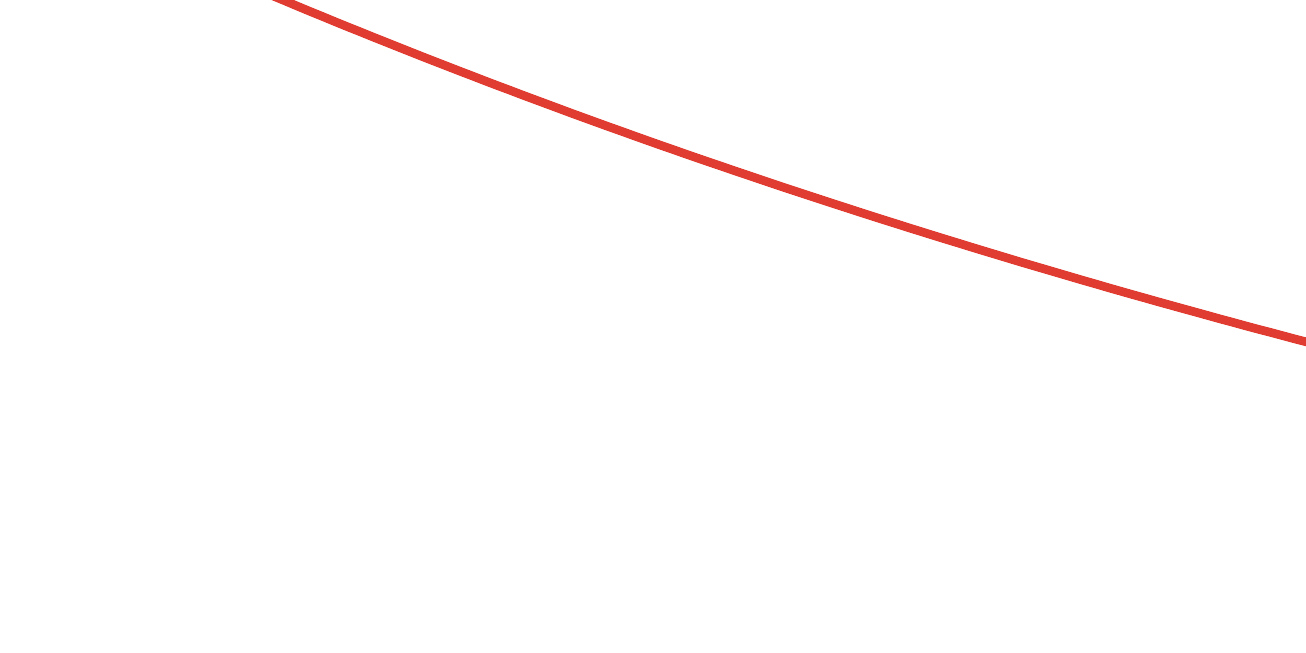
1. Each of the following functions ,  , and  represents the amount of money in a bank account, in dollars, as a function of time , in years. They are each written in form .  
     
     
     
   1. Use graphing technology to graph each function on the same coordinate plane.
   2. Explain how changing the value of changes the graph.
2. Here are equations defining functions , , and . They are also written in the form .  
     
     
   1. Use graphing technology to graph each function and check your prediction.
   2. Explain how changing the value of changes the graph.

#### Are you ready for more?

As before, consider bank accounts whose balances are given by the following functions:

Which function would you choose? Does your choice depend on ?

### 12.3: Graphs Representing Exponential Decay



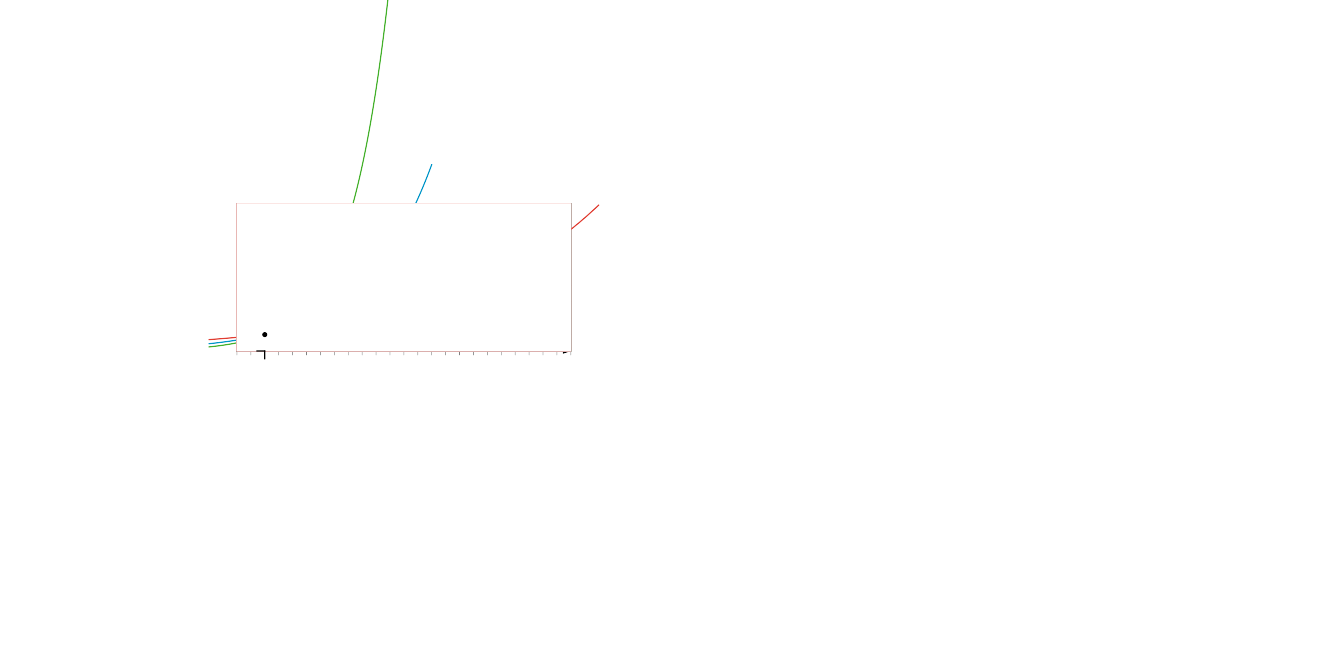
1. Match each equation with a graph. Be prepared to explain your reasoning.
2. Functions and are defined by these two equations: and .
   1. Which function is decaying more quickly? Explain your reasoning.
   2. Use graphing technology to verify your response.

### Lesson 12 Summary

An exponential function can give us information about a graph that represents it.

For example, suppose the function  represents a bacteria population  hours after it is first measured and . The number 5,000 is the bacteria population measured, when is 0. The number 1.5 indicates that the bacteria population increases by a factor of 1.5 each hour.

A graph can help us see how the starting population (5,000) and growth factor (1.5) influence the population. Suppose functions and represent two other bacteria populations and are given by  and  . Here are the graphs of , , and .



All three graphs start at but the graph of  grows more slowly than the graph of while the graph of grows more quickly. This makes sense because a population that doubles every hour is growing more quickly than one that increases by a factor of 1.5 each hour, and both grow more quickly than a population that increases by a factor of 1.2 each hour.



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