

**Module I, Course Activity 7: Exponential Functions – Exploration of Rate of Change Relationships**  
**Change Relationships**  
**Synthesis Questions**

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Name: \_\_\_\_\_

*Purpose:* To synthesize what you have learned about rate of change equations.

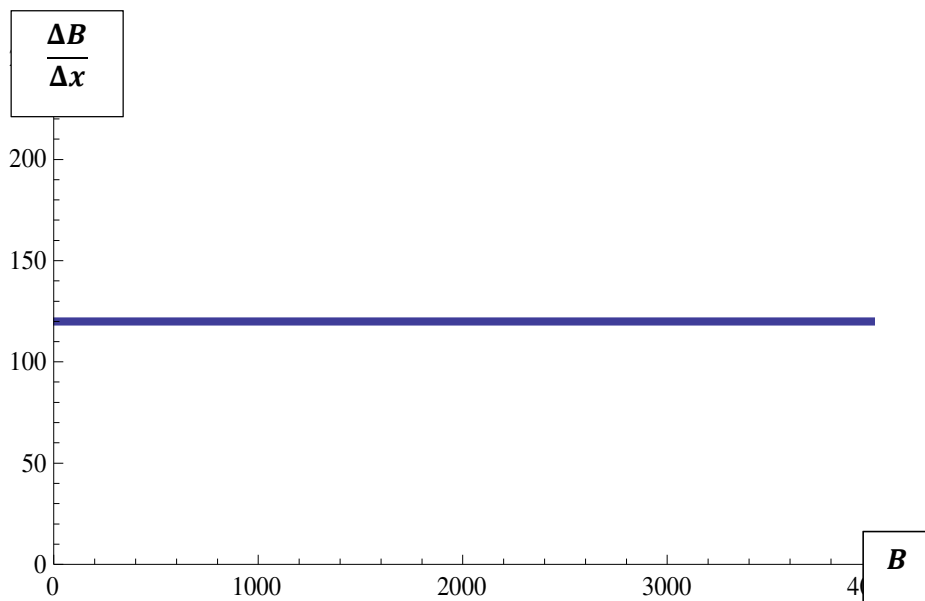
*Procedure:* Work on the following questions outside of class. You may consult with one or two other students. Each student should hand in their own copy of these synthesis questions.

1. For a certain toy manufacturing company, the daily cost of producing super balls increases by \$120 for each additional one thousand super balls produced.

- a. Let  $B = B(x)$  represent the daily cost (in dollars) of producing  $x$  thousand super balls. Write a mathematical equation (rate of change equation) that models the rate of change of  $B(x)$ :

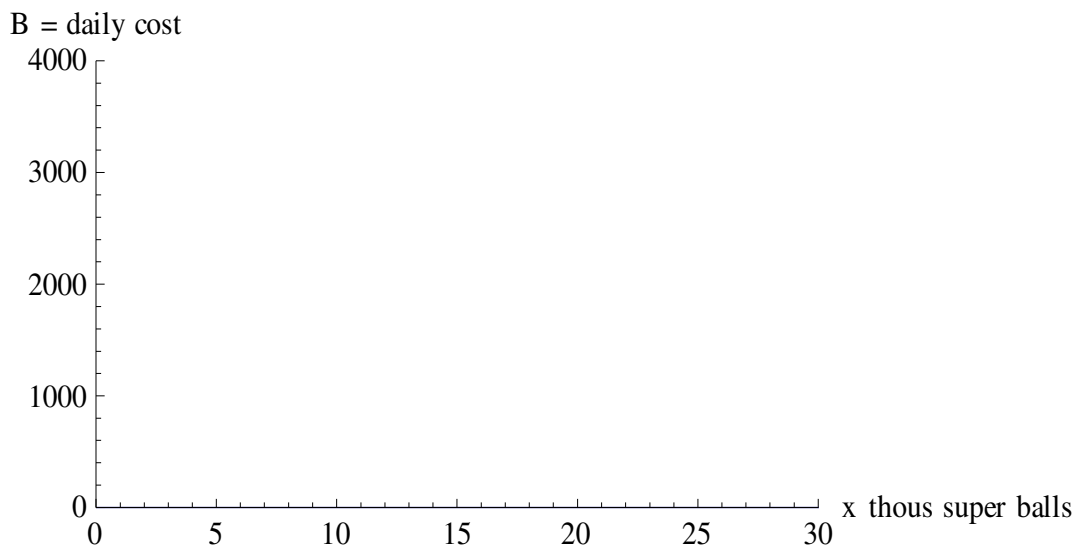
$$\frac{\Delta B}{\Delta x} = \underline{\hspace{2cm}} \quad (\text{what are the units here?})$$

- b. The graph of  $\frac{\Delta B}{\Delta x}$  as a function of the daily cost,  $B$ , is provided below:

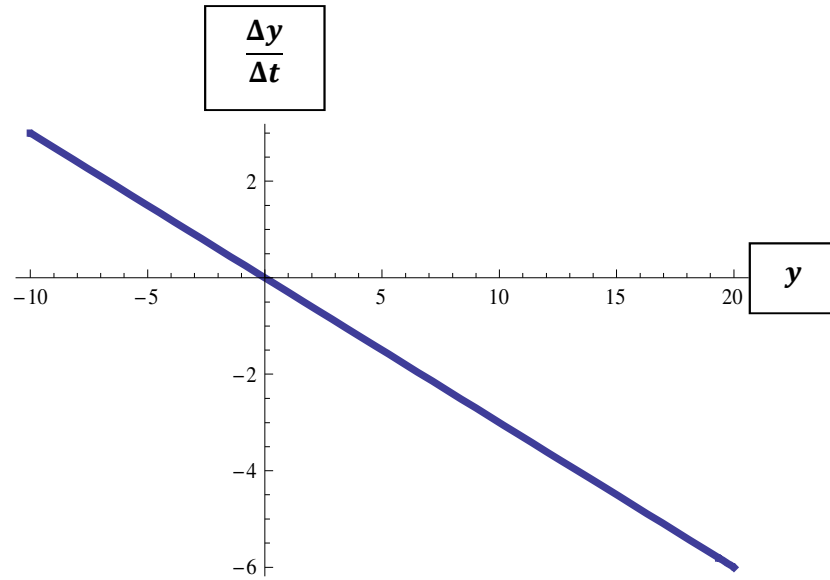


## &lt;Problem #1 Continued&gt;

- c. If the daily cost of producing super balls is currently \$2400, what is the rate of change of the cost (include units)?
- d. If the daily cost of producing super balls is currently \$2550, what would the daily cost be if production was increased by 1000 super balls?
- e. If overhead costs are \$500 each day, use your work above to help you sketch a graph of the daily cost  $B$  as a function of the number of super balls produced,  $x$ . Explain how this graph relates to the graph of the rate of change equation shown in part (b).



2. Rate of Change Equation Solutions: Consider the following graph of  $\frac{\Delta y}{\Delta t}$  as a function of  $y$  (a rate of change equation).



From the graphs below, choose the graphs of  $y$  as a function of  $t$  that **could be described** by the rate of change equation graphed above. (There may be more than one!!)

