

frq

A student won \$500 in an art contest. At first, the student kept the money in a desk. After 10 months, the student deposited the money in a savings account that earned interest. Six months after depositing the money ( $t = 6$ ), the amount in the account is \$508.67. Twelve months after depositing the money ( $t = 12$ ), the amount in the account is \$517.50.

The amount of money the student has can be modeled by the piecewise function  $M$  given by

$$M(t) = \begin{cases} 500 & \text{for } -10 \leq t < 0 \\ ab^{(t/12)} & \text{for } t \geq 0 \end{cases},$$

where  $M(t)$  is the amount, in dollars, at time  $t$  months since the \$500 was deposited into the savings account. A negative value for  $t$  represents the number of months before the student deposited the \$500 into the savings account.

### 11. Part A

- Use the given data to write two equations that can be used to find the values for constants  $a$  and  $b$  in the expression for  $M(t)$ .
- Find the values for  $a$  and  $b$  as decimal approximations.

#### Part B

- Use the given data to find the average rate of change of the amount of money the student has, in dollars per month, from  $t = -2$  to  $t = 12$  months. Express your answer as a decimal approximation. Show the computations that lead to your answer.
- Use  $M(12)$  and the average rate of change found in (i) to estimate the amount of money, in dollars, the student has when  $t = 20$  months. Show the work that leads to your answer.
- Let  $A(t)$  be the estimate of the amount of money, in dollars, the student has at time  $t$  months using the average rate of change found in (i). In (ii),  $A(20)$  was computed. If  $A(t)$  is used to estimate values for  $M(t)$  for  $t > 12$ , the error in the estimates will increase as  $t$  increases. Explain why this is true.

#### Part C

The student plans to close the account when the amount of money in the account reaches \$565. Explain how this information can be used to determine the domain limitations for the model  $M$ .

### Part A

Select a point value to view scoring criteria, solutions, and/or examples to score the response.



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