

10. [10 points] David and Harold each have some money that they deposit in a bank account at the same time. Let $D(t)$ and $H(t)$ be the amount of money (in dollars) in David's and Harold's bank accounts respectively, t years after they make the initial deposit. Harold's initial deposit of m dollars grows at a continuous annual rate of 10%, and $D(t) = 20,000(1.1)^t$.

- a. [2 points] Find the growth factors of the functions D and H . Your answer must be in exact form.

Solution:

Growth factor for $D = 1.1$ Growth factor for $H = e^{0.1}$.

- b. [2 points] Is the following statement true or false? If Harold's initial deposit is larger than David's, then there is some time after they made the initial deposit when David's and Harold's bank accounts have the same amount of money. Circle your answer.

True

False

Solution:

- c. [3 points] What should Harold's initial deposit be, in order for the amount of money in David's and Harold's bank accounts to be the same ten years after they made their initial deposits? Find your answer algebraically. Your answer must be exact or accurate up to the nearest cent.

Solution:

$$20,000(1.1)^{10} = me^{1(10)}$$

$$\text{Harold's initial deposit} = m = \frac{20,000(1.1)^{10}}{e} \approx 19,083.69 \text{ dollars.}$$

- d. [3 points] How many years does it take for David's initial deposit to triple? Find your answer algebraically. Your answer must be exact or accurate up to the first two decimals.

Solution:

$$60,000 = 20,000(1.1)^t$$

$$3 = (1.1)^t$$

$$\ln(3) = t \ln(1.1)$$

$$t = \frac{\ln(3)}{\ln(1.1)} \approx 11.52 \text{ years.}$$