BECA / IB Math 5 Exponential functions Name:
9 March 2022

5.10 Quiz: Exponential functions

Round all currency amounts to the nearest hundredth.

1. Frank puts \$2,000 into an investment account with an annual interest rate of 3.00%. Find the balance after one year.

2. Allen invests \$87,500 in an account with an annual interest rate of 2.85%. Find the balance after 4 years.

3. Sharia puts \$30,000 into an investment account with an annual interest rate of 4.25%. Find the number of years required for the balance to reach \$38,510.37.

4. A bond with a three year maturity and principal amount of \$10,000 compounds monthly with an annual interest rate of 3.00%.

   (a) How many compounding periods are there per year?

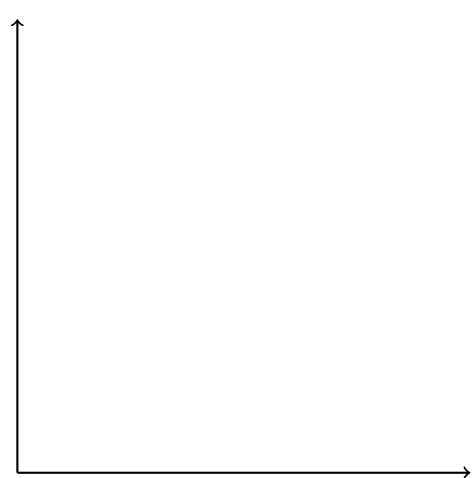
   $k =$

   (b) Find the final balance of principal and interest after three years.

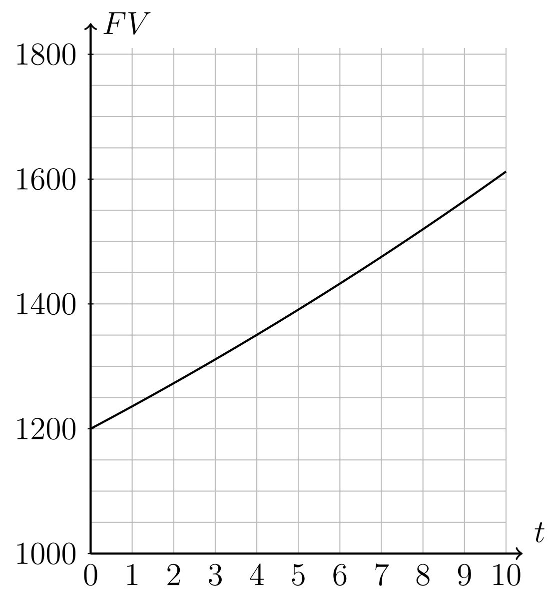
5. Lily invested SGD 2000 (Singapore dollars) in an account that pays 1.85% interest per year compounded monthly. (show your working with a labeled sketch using the axes)

   (a) Find how much Lily had in the account after 3 years.

   (b) Find the number of years until she had SGD 2150 in the account.



6. The graph shows the exponential function $FV = 1200 \times \left(1 + \frac{3.00}{100}\right)^t$ representing the balance of an investment account earning a fixed rate of interest over t in years.



(a) Write down the initial deposit in the account.

(b) Write down the annual interest rate.

(c) How much will the account hold at the end of ten years, to the nearest hundred dollars?

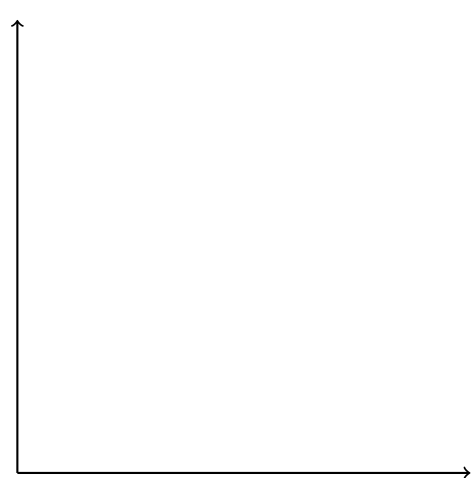
(d) When will the balance be \$1350, to the nearest year?

7. The half life of radioactive iodine 131 is eight days. That is, one half of this isotope decays over this period of time. Given an intial amount of I_{131} of N_0, use this formula for the amount remaining $N(t)$ as a function of time t in days:

$$N(t) = N_0 \times \left(\frac{1}{2}\right)^{t/8}$$

(a) How long does it take for half of a given amount of I_{131} to decay?

(b) Find the fraction of iodine 131 that would remain after 30 days.



Sketch a labeled graph as working.

8. A fruit fly population doubles every 5 days. There are currently ten fruit flies in a laboratory container. With t representing time, in days, then the population of flies can be modeled by

$$P(t) = A \times b^{t/5}$$

   (a) Write down the value of A

   (b) Write down the value of b

   (c) About how many flies will there be in two weeks?

   (d) Find the time needed to reach a population of 160.

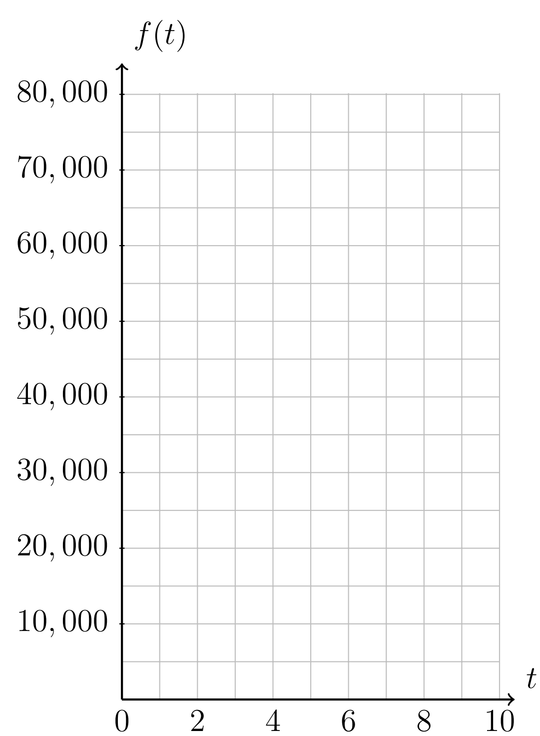
9. Graph $f(t) = 75,000\,(1 - 0.25)^t$, representing the depreciation of an asset over t years.

   (a) Write down the initial cost of the asset.

   (b) Write down the percentage value lost each year.

   (c) Find the value of the investment after one year.

   (d) Find the number of years to depreciate three quarters of the value.



10. The spread of a virus in the lungs is modeled by $y = 15e^x$, with x the time in hours.

    (a) Find the quantity of the viruses after two hours.

    (b) Find the number of hours for viruses to spread to 45,000.

11. The temperature of hot metal bar as it cools is modeled by the function

$$T(x) = 150e^{-0.07x} + 45$$

where $T(x)$ is the temperature in degrees Celsius and x is the time in hours.

    (a) Write down the initial temperature at time zero.

    (b) Find the temperature after 24 hours.

    (c) Find the time to cool to 100°C.

    (d) Graph the bar's temperature. Label each of your answers with their values.