BECA / IB Math 5 Exponential functions   Name:

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5.9 Prequiz: Exponential functions

Round all currency amounts to the nearest hundredth.

1. Isabella puts \$1,000 into an investment account with an annual interest rate of 4.00%. Find the balance after one year.

2. Louise invests \$8,750 in an account with an annual interest rate of 3.95%. Find the balance after 4 years.

3. William puts \$10,000 into an investment account with an annual interest rate of 5.75%. Find the number of years required for the balance to reach \$14,789.81.

4. A bond with a three year maturity and principal amount of \$20,000 compounds semi-annually with an annual interest rate of 4.25%.

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

    $k =$

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

5. Xi invested TWD 4000 (Taiwan dollars) in an account that pays 2.85% interest per year compounded monthly. (show your working with a labeled sketch)

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

   (b) Find the number of years until he had TWD 5000 in the account.
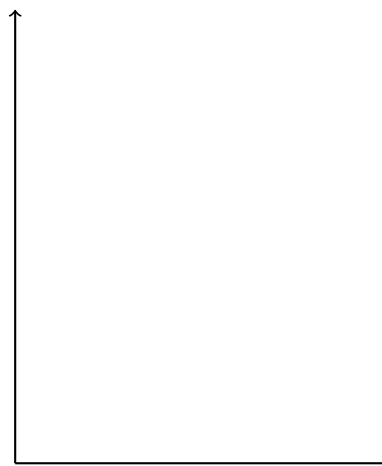
6. The graph shows the exponential function $FV = 1,250 \times \left(1 + \dfrac{4.25}{100}\right)^t$ representing the balance of an investment account earning a fixed rate of interest over t in years.

   (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 $000?

   (d) When will the balance be $1,600?
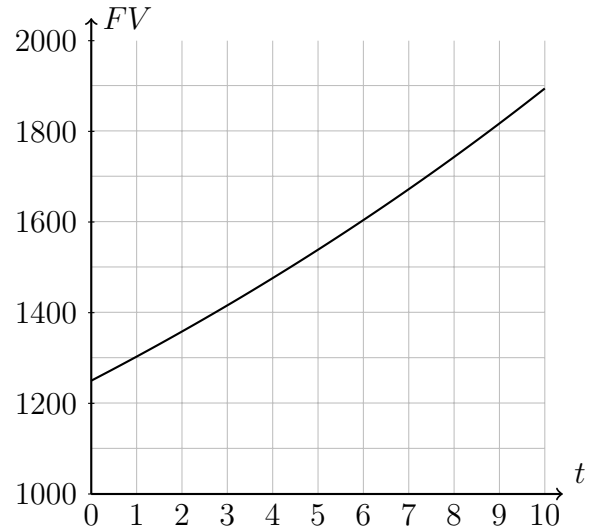
7. Radioactive elements decay over time, with one half of the atoms decaying over a fixed period of time, the "half life." The half life of plutonium-238 is about 90 years. Use the formula $y = A \times \left(\dfrac{1}{2}\right)^{t/90}$.

   (a) Find the percentage of plutonium that would remain after 1000 years.

   (b) Find the number of years required for 99 percent of the plutonium to decay.

8. The spread of a farm disease can be modeled by the equation $y = 6 + e^x$, where x is the time in days.
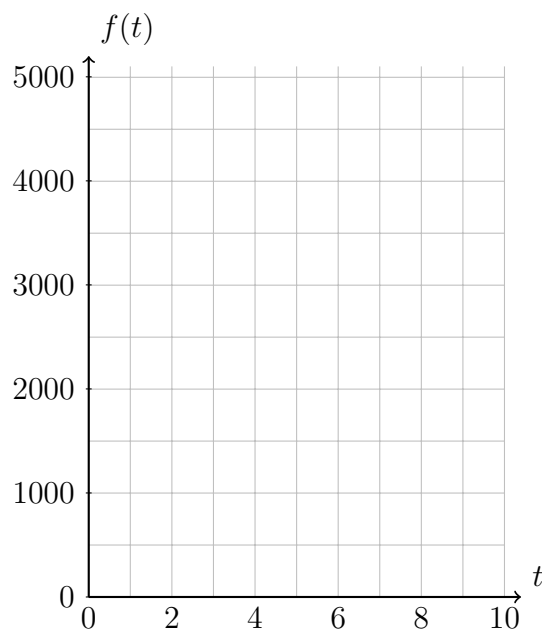
   (a) Find the number of animals with the disease after six days.

   (b) Find the number of days for 500 animals to be infected.

9. On the grid below draw the exponential function $f(t) = 1700 \times (1 + 0.095)^t$ representing the growth of an investment over t years.

   (a) Write down the initial value of the investment.

   (b) Write down the annual interest rate.

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(c) Find the value of the investment after ten years.

$f(t)$

```
5000
4000
3000
2000
1000
   0
    0    2    4    6    8   10    t
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(d) Find the number of years it takes the investment to double in value.

10. A rabbit population doubles every 4 weeks. There are currently five rabbits in a restricted area. With t representing time, in weeks, then the population of rabbits can be modeled by

$$P(t) = A \times b^{t/4}$$

(a) Write down the value of A

(b) Write down the value of b

(c) About how many rabbits will there be in 98 days?

(d) After how many weeks will there be approximately 160 rabbits?

11. The temperature of a hot iron as it cools is modeled by the function

$$T(x) = 350e^{-0.035x} + 18$$

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

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

(b) Find the temperature after 20 minutes.

(c) When will the temperature of the iron reach 75 degrees Celsius?

(d) On the graph below, sketch the temperature of the iron, labeling the points above A, B, and C.