BECA / Huson / Unit 4: Linear and Exponential functions Name: SOLUTIONS
3 November 2022

4.3 Classwork: Compound Interest

I can calculate compound interest CCSS.HSF.LE.A.2

$FV = PV \times \left(1 + \frac{r}{100k}\right)^{kn}$ where FV is the future value,

PV is the present value, n is the number of years,
k is the number of compounding periods per year,
r% is the nominal annual rate of interest

1. Louis invests \$8,500 in an account with an annual interest rate of 4.15%. What is the balance after 4 years?

$FV = 8,500\left(1 + 0.0415\right)^{4}$

$= 10,001.29$

2. A three year loan for \$17,500 compounds monthly with an annual interest rate of 7.25%.

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

   $k =$ 12

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

$FV = 17,500\left(1 + \frac{0.0725}{12}\right)^{12 \cdot 3} = 21,737.6653\ldots$

$\approx \$21,737.67$

3. The graph shows the exponential function $f(t) = 1200 \times (1 + 0.18)^t$ representing 18% annual growth rate over t years.

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

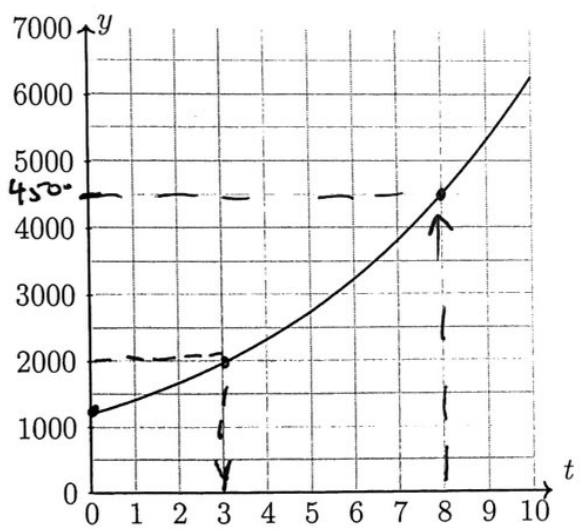
   1200

   (b) Find $f(8)$

   4500

   (c) Find t such that $y = 2000$

   3



4. 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 $N(t) = N_0 \times \left(\frac{1}{2}\right)^{t/90}$.

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

   $N(t) = 100\% \cdot \left(\frac{1}{2}\right)^{1000/90} = 0.0452\%$

   597 1.0073
   598 0.9995

   (b) Find the number of years required for 99 percent of the plutonium to decay. 598 yrs

5. Carlos puts \$9,800 into an investment account with an annual interest rate of 2.75%. What is the balance after 3 years, rounded to the nearest cent?

   $FV = 9,800\,(1+0.0275)^3 = 10,630.93756$

   $\approx \$10,631.94$

6. The graph shows the exponential function $FV = 1,100 \times \left(1+\frac{6.125}{100}\right)^t$ 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.

   \$1100

   (b) What is the annual interest rate?

   6.125%

   (c) Approximately how much will the account hold at the end of ten years?

   \$2,000

   (d) When will the balance be \$1,400?

   4 years