1. **(5 points)** *Your savings account earns 2% annual interest compounded monthly. How much would you need to deposit now in order to have $5000 in three and a half years?*

   The desired future value is $F = 5000$, the timeframe is $t = 3.5$, and the terms of the interest growth are $r = 0.02$ and $n = 12$ (monthly). Thus, we want to find a present value which the statement

   $$5000 = P\left(1 + \frac{0.02}{12}\right)^{12\times 3.5}$$

   true. Solving that algebraically gives

   $$P = \frac{5000}{\left(1 + \frac{0.02}{12}\right)^{12\times 3.5}} \approx 4662.24$$

   so the required initial investment would be $4662.24.

2. **(5 points)** *Municipal bonds are being issued at a cost of $70, reaching a mature value of $120 in 30 years. What is the annual percentage yield on these bonds?*

   This is an investment over a timeframe $t = 30$ with a present value $P = 70$ and future value $F = 120$. What is desired is the annual interest rate r in the equation

   $$120 = 70(1 + r)^{30}$$

   which can be solved to yield

   $$r = \sqrt[30]{\frac{120}{70}} - 1 \approx 0.018$$

   so the APY is 1.8%.

3. **(5 points)** *Victoria is planning to put $2000 into a certificate of deposit that earns a 3% annual interest rate compounding monthly. How long (with appropriate units) should she choose as the lifetime of this CD, if she wants it to have a value of $3500 at the end?*

   Victoria's investment has a principal $P = 2000$, interest terms $r = 0.03$ and $n = 12$, and a desired future value $F = 3500$. What we seek is either the number of years t or alternatively the number of months $m = 12t$ over which her account needs to grow. If we plug into the equation

   $$3500 = 2000\left(1 + \frac{0.03}{12}\right)^{m}$$

   our solution will be

   $$m = \frac{\log \frac{3500}{2000}}{\log\left(1 + \frac{0.03}{12}\right)} = 224.126$$

   which rounds up to 225 months; that could alternatively be written as 18.75 years.