Mathematical Concepts — Joysheet 3
MAT 117, Spring 2013 — D. Ivanšić

Name: Saul Ocean

Show all your work!

1. (8pts) Sabrina would like to have $5000 for a decent used car. How much should she deposit now in an account bearing 2.66%, compounded monthly, in order to have the desired amount in three and a quarter years? How much of the $5000 came from interest?

$A = P\left(1+\frac{r}{n}\right)^{nt}$

$5000 = P\left(1+\frac{0.0266}{12}\right)^{12\cdot 3.25}$

$5000 = P \cdot 1.0901\ldots$

$P = \frac{5000}{1.0901\ldots} = 4586.35$

From interest:

$5000 - 4586.35 = 413.65$

2. (6pts) Bank of Hind Quarters is offering a 2.38% interest rate on an account that is compounded daily, while Rear End Bank has an account at 2.39%, compounded quarterly. Which account is the better deal?

annual yield:

$Y_1 = (1+0.0238/365)^{365} - 1 = 0.0240847$ → 2.40847 %

$Y_{12} = (1+0.0239/4)^{4} - 1 = 0.0241151$ → 2.41151 %

Better at Rear End Bank

3. (10pts) An investment that you made quadrupled in value in 5 years. Assuming annual compounding, at what annual rate did this investment grow?

$4P = P(1+r)^{1\cdot 5} \mid \div P$

$4 = (1+r)^5 \mid \sqrt[5]{\ }$

$\sqrt[5]{4} = 1+r$

$1.3195\ldots = 1+r \mid -1$

$0.319508 = r$

Annual rate of 31.9508 %

4. (10pts) To save for a trip to Mt. Everest in six years (approximate cost \$50,000), you make monthly deposits into an account bearing 6.5%, compounded monthly.
a) How much should you deposit every month to reach your goal?
b) How much would you earn in interest over the six years?

a) $A = P\dfrac{\left(1+\frac{r}{n}\right)^{nt}-1}{\frac{r}{n}}$

$50{,}000 = P\dfrac{\left(1+\frac{0.065}{12}\right)^{12\cdot 6}-1}{\frac{0.065}{12}}$

$50{,}000 = P \cdot 87.77\ldots$

$P = \dfrac{50000}{87.77\ldots} = 569.66$

b) Total payments $= 569.66 \cdot 12 \cdot 6 = 41{,}015.22$

Total interest $= 50{,}000 - 41{,}015.22$

$= 8984.48$

5. (14pts) At the time of little Ruby's birth, her parents decided to save some money for her college. They only started to have extra money when Ruby was 4, when they started depositing \$300 every month into an account bearing 6.4% interest, compounded monthly. When Ruby was 14, however, new financial hardship forced the parents to stop their contributions, but they left the money in the account.
a) How much is in the account when Ruby is 18?
b) How much of it was from deposits, and how much from interest?

a) Multiple contributions from age 4 to 14 (10 years)

$A = P\dfrac{\left(1+\frac{r}{n}\right)^{nt}-1}{\frac{r}{n}}$

$= 300\dfrac{\left(1+\frac{0.064}{12}\right)^{12\cdot 10}-1}{\frac{0.064}{12}}$

$= 300 \cdot 167.485\ldots = 50{,}245.79$ at age 14

Single deposit from age 14 to 18 (4 years)

$A = P\left(1+\frac{r}{n}\right)^{nt} = 50{,}245.79\cdot\left(1+\frac{0.064}{12}\right)^{12\cdot 4}$

$= 64861.00$

b) Total deposits $= 300 \cdot 12 \cdot 10 = 36{,}000$

From interest $= 64{,}861 - 36{,}000$

$= 28{,}861$

6. (12pts) Miguel would like to save \$10,000 to add a jacuzzi to his home. If he can set aside \$350 every month into an account bearing 5.41%, compounded monthly, how long will it take him to save the desired amount?

$A = P\dfrac{\left(1+\frac{r}{n}\right)^{nt}-1}{\frac{r}{n}}$

$10{,}000 = 350\dfrac{\left(1+\frac{0.0541}{12}\right)^{12t}-1}{\frac{0.0541}{12}} \quad \div 350$

$28.571\ldots = \dfrac{(1.0045\ldots)^{12t}-1}{\frac{0.0541}{12}} \quad \cdot \frac{0.0541}{12}$

$0.1288\ldots = (1.0045\ldots)^{12t} - 1 \quad +1$

$1.1288\ldots = (1.0045\ldots)^{12t} \quad \log$

$\log 1.1288\ldots = 12t \log(1.0045\ldots)$

$t = \dfrac{\log 1.1288\ldots}{12\log(1.0045\ldots)} = 2.244667$

About 224 years.