Assignment #1 solutions

1.

A. Freshman year = \$25,000 ($FVIF_{3\%,18}$) = \$42,560.83
Sophomore year = \$25,000 ($FVIF_{3\%,19}$) = \$43,837.65
Junior year = \$25,000 ($FVIF_{3\%,20}$) = \$45,152.78
Senior year = \$25,000 ($FVIF_{3\%,21}$) = \$46,507.36
In EXCEL, 25,000 = PV, 3% = Rate, 0 = PMT(to be safe), 18, … 21= Nper

B. Today's single deposit = \$42,560.83($PVIF_{7\%,18}$) + \$43,837.65($PVIF_{7\%,19}$) + \$45,152.78($PVIF_{7\%,20}$) + \$46,507.36($PVIF_{7\%,21}$) + \$10,000($PVIF_{7\%,21}$)= \$50,029.29

C. Simplest way: \$2,000 + PMT($PVIFA_{7\%,18}$) = \$50,029.29
\$50,029.29 - 2,000 = \$48,029.29 = PV, 7% = Rate, 18 = N, 0 = FV, type=0, PMT = \$4,774.72 (Ordinary annuity)
Or alternative way: Find the present values of all the college costs and \$10,000 at 18 and total them (=\$169,095.62). Subtract \$2,000($FVIF_{7\%,18}$)(=\$6,759.36) from this total, resulting in\$162,333.76. This is the FV of the annuity of the parents deposits, solve for PMT.

D. Assuming that the fund will still grow at 7% after year 18, the total amount you need by 18 = SUM(PV of cash flows from A and PV of 10,000) at 18 = \$169,095.62

If you assume that \$2,000 from grandparents will still grow at 7%,
The amount you have to save by 18 = \$169,095.62 - \$2,000 ($FVIF_{7\%.18}$) = \$162,333.76

To prepare for this amount, assuming \$3,500 annual deposit, the investment rate can be found as follows:
\$162,333.76=\$3,500($FVIFA_{i,18}$), in Excel, use Rate function,
(162,333.76=FV, 18=Nper, -3500=PMT, 0=PV, type =0)
Then, you will get APR=10.17%. Thus, the new investment rate should be 10.17% - 7% = 3.17% higher.

OR

If you assume that \$2,000 from grandparents will grow at the same new investment rate,

Then you need to prepare total of \$169,095.62 by 18 by making \$3,500 annual deposit plus lump-sum saving of \$2,000 today at the new rate. Thus,
\$169,095.62 = \$3,500(FVIFA,i,18) + \$2,000 (FVIF,i,18)
Using EXCEL, FV=\$169,095.62, PV=-2,000, PMT=-3,500 Nper=18, then Rate = 9.91%. Therefore, the new investment rate should be 9.91% APR. Thus, the new investment rate should be 9.91% - 7% = 2.91% higher.

2.

The cash flow (CF) worksheet in your financial calculator is handy here. Or you can use Excel, NPV function.

A. PV = 20M ($PVIF_{10\%,2}$) + 16M ($PVIF_{10\%,3}$) + 16M ($PVIF_{10\%,4}$) +16M ($PVIF_{10\%,5}$) + 23M ($PVIF_{10\%,6}$) +23M ($PVIF_{10\%,7}$) +23M ($PVIF_{10\%,8}$) +23M ($PVIF_{10\%,9}$) = \$94.68 Million.

B. PV = 10M ($PVIF_{10\%,2}$) + 20M ($PVIF_{10\%,3}$) + 20M ($PVIF_{10\%,4}$) +20M ($PVIF_{10\%,5}$) + 20M ($PVIF_{10\%,6}$) +30M ($PVIF_{10\%,7}$) +30M ($PVIF_{10\%,8}$) +30M ($PVIF_{10\%,9}$) = \$ 102.77 Million.

3.

A. The amount of money in Prof Kim's IRA account now is;
1,000($FVIFA_{10\%/12,\ 25*12}$)= \$1,326,833
His monthly withdrawal will be;
Annuity-Due: \$1,326,833 = PMT($PVIFA_{10\%/12,25*12}$)^{Due} or
PMT($PVIFA_{10\%/12,25*12}$)*(1+0.1/12)
Using Excel, PMT function or your financial calculator, PMT = \$11,957.30

B. Now his monthly withdrawal is; 11,957.30*1.2=14,348.76
The amount he needs at 65 is
14,348.76($PVIFA_{10\%/12,\ 25*12}$)^{Due}=14,348.76($PVIFA_{10\%/12,25*12}$)(1+0.1/12)=
1,000($FVIFA_{10\%/12,\ N}$)=\$1,592,200.08

In Excel, use Nper function to get N.(0.1/12=rate, -1,000=PMT, FV=1,592,200.08, Type =0)
Then, N=320.29 months=> 320.29/12=26.7years
So he should have made savings for 26.7 years before his first withdrawals. Thus, he should have started about 1.7years (26.7-25) earlier.

4.

A. \$22,000 = PMT($PVIFA_{6.5\%/12,60}$), in Excel, PMT function,
22,000 = PV, 0.065/12 = RATE, 5X12=60 = Nper, 0 = FV, PMT = \$430.46

B. APR for the computer loan;
\$1599 = \$45($PVIFA_{i/12,48}$), in Excel, use Rate function,
1599 = PV, 48 = Nper, -45 = PMT, 0 = FV, Rate = 1.30% = I/12; APR = 12x1.3% =15.6%
Indifferent monthly payment;
1,599=45($PVIFA_{12\%/12,\ N}$). Use Nper function in Excel.
rate=12%/12, pmt=45, pv=1,599, fv=0, type=0, then
N=44.12 months.

C. 1st Option: \$750 cash back and 0.9% APR Financing
\$15,000-\$750 = \$14,250 = PV, 0.9%/12 = Rate, 48 = Nper, 0 = FV, PMT = \$302.36
2nd Option: \$1500 cash back and 7.9% APR Financing:

$15,000 - $1500 = $13,500 = PV, 7.9%/12 = I/Y, 48 = Nper, 0 = FV, PMT = $328.94
Choose the $750 cash back and 0.9% APR financing.
Indifferent interest rate;
13,500=302.36(PVIFA $_{i\%, 48}$). Use Rate function in Excel.
Nper=48, pmt=302.36, pv=13,500, fv=0, type=0, then
i=0.3%, APR=0.3%*12=3.6%
To be indifferent, the interest rate of National City Bank should be 3.6% APR.

D. $100(FVIFA$_{8\%/12,3*12}$)*(1+0.08): -100 = PMT, 8%/12 = Rate, 36 = Nper, 0 = PV, Type:1(annuity due) => FV =$4,081
Using the EAR equation or EFFECT function in Excel, 8.30% = EAR
E. CD #1: Using the EAR equation, 6.13% = EAR
CD #2: Using the EAR equation, 6.17% = EAR
Choose CD #2.
F. $5,000 = $150(PVIFA$_{23.9\%/12,N}$), Using NPER function in Excel,
5,000 = PV, 23.9%/12 = Rate, -150 = PMT, 0 = FV, Nper = 55.29 Thus it will take at least 56 months to pay off his credit card balance.