MATH 373
Quiz 3
Fall 2019

October 22, 2019

1. Liu Manufacturing borrows 1,000,000 to be repaid with annual payments of 90,000 followed by a drop payment. The annual effective interest rate on the loan is 6.3%.

   Determine the amount of the drop payment.

   Solution:

   Using the BA-II+ Calculator:

   $$\boxed{PV} \leftarrow 1,000,000; \boxed{I/Y} \leftarrow 6.3; \boxed{PMT} \leftarrow -90,000$$

   $$\boxed{CPT}\boxed{N} \Rightarrow 19.7065$$

   Round down to 19

   $$\boxed{2nd}\boxed{Amort}\boxed{P1} \leftarrow 19; \boxed{P2} \leftarrow 19; \boxed{\downarrow}\boxed{Bal} \Rightarrow 60,353.61$$

   $$Drop = (60,353.61)(1.063) = 64,155.89$$

2. Sharruna invests 20,000 in the Tang Fund at the end of each year for 13 years. The Tang Fund earns an annual effective interest rate of 7%.

   At the end of each year, Sharruna takes the interest earned in the Tang Fund and moves it into the Vandokkenburg Fund. Vandokkenburg earns and annual effective interest rate of 9% per year.

   Determine the amount that Sharruna has at the end of 13 years taking into account both the Tang Fund and the Vandokkenburg Fund.

   Solution:

   In the first year, there is no interest transferred to the Vandokkenburg Fund as there is no money invested in the Tang Fund the first year. At the end of the second year, 1400 is withdrawn from Tang and invested in Vandokkenburg. At the end of the third year, 2800 is withdrawn from Tang and invested in Vandokkenburg. The amount continues to increase each year.

   At the end of 13 years, there will be (13)(20,000) = 260,000 in the Tang Fund

   At the end of 13 years, the value of the Vandokkenburg Fund will be:

$$\left[1400a_{\overline{12|}}+\frac{1400}{0.09}\left(a_{\overline{12|}}-12(1.09)^{-12}\right)\right](1.09)^{12}=154,830.43$$

$$Total=260,000+154,830.43=414,830.43$$

3. Kelley is the beneficiary of the Wei Trust. The Wei Trust will pay Kelley quarterly payments for the next 10 years. The payments will be at the end of each quarter and will not be level.

   The quarterly payments in the first year will each be 1000. The quarterly payments in the second year will each be 2000. The quarterly payments in the third year will each be 3000. The payments will continue to increase in the same pattern until quarterly payments of 10,000 will be made in the 10th year.

   Using an annual effective interest rate of 8%, calculate the present value of Kelley's payments.

   Solution:

   To solve this problem, we note that the payments are level during each year but increase year to year, so we need to use the formula that does not follow the rules.

   We are given $i = 0.08$ and we will need $\frac{i^{(4)}}{4}$

$$(1+i) = \left(1+\frac{i^{(4)}}{4}\right)^4 \Rightarrow \frac{i^{(4)}}{4} = (1.08)^{\frac{1}{4}} - 1 = 0.019426547$$

$$PV = (1000)\left(\frac{\left[\frac{1-(1.08)^{-10}}{0.08}\right](1.08) - 10(1.08)^{-10}}{0.019426547}\right) = 134,607.20$$