MATH 373
Quiz 2
Spring 2019
February 7, 2019

1. Kiersten borrows 20,000 from Sarah at a nominal annual interest rate of 9% compounded monthly.

   Kiersten will repay the loan with two payments of P. The first payment of P will be at the end of three years and the second payment of P will be at the end of seven years.

   Determine P.

   Solution:

   $$20,000\left(1+\frac{0.09}{12}\right)^{(12)(7)} = P\left(1+\frac{0.09}{12}\right)^{(12)(4)} + P$$

   $$P = \frac{20,000\left(1+\dfrac{0.09}{12}\right)^{(12)(7)}}{\left(1+\dfrac{0.09}{12}\right)^{(12)(4)}+1} = 15,408.39$$

2. Dylan invests 13,000 today in an account at Nick Bank. Dylan also invests another 5000 in the same account at the end of 5 years.

The account at Nick Bank earns a force of interest of $0.08 + 0.002t$ where t is measured from today.

Determine how much Dylan has at the end of 9 years.

Solution:

$$Amount = 13,000e^{\int_{0}^{9}(0.08+0.002t)\,dt} + 5000e^{\int_{5}^{9}(0.08+0.002t)\,dt}$$

$$= 13,000e^{\left[0.08t+0.001t^2\right]_{0}^{9}} + 5000e^{\left[0.08t+0.001t^2\right]_{5}^{9}} =$$

$$13,000e^{\left[0.08(9)+0.001(9)^2-0\right]} + 5000e^{\left[0.08(9)+0.001(9)^2-0.08(5)-0.001(5)^2\right]}$$

$$13,000e^{0.801} + 5000e^{0.376} = 36,243.21$$

3. Zack loans 5000 to Honor. Honor will repay the loan with a payment of 2000 at the end of each year for three years.

Zack reinvests each payment from Honor at an annual effective interest rate of 6%.

Determine Zack's annual effective return (interest rate) on this this loan taking into account reinvestment.

Solution:

$$5000(1+i)^3 = 2000(1.06)^2 + 2000(1.06) + 2000 = 6362.20$$

$$1+i = \left(\frac{6362.20}{5000}\right)^{1/3} = 1.08391 ==> i = 0.08391$$