

# Math 373

## Fall 2018

### Quiz 1

September 6, 2018

1. Lauren invests 100,000 in the Diego Fund. The Diego Fund pays a nominal interest rate of 10% compounded quarterly. At the end of  $Y$  years, Lauren has 361,111.23.

Alex invests 100,000 in Ethan Bank. Ethan Bank pays simple interest at a rate of  $s$ . At the end of  $Y$  years, Alex has 361,111.23.

Determine the annual effective interest rate that Alex earns during the 10<sup>th</sup> year of his investment.

**Solution:**

Lauren:

$$100,000 \left( 1 + \frac{i^{(4)}}{4} \right)^{(4)(Y)} = 361,111.23 \implies \left( 1 + \frac{0.10}{4} \right)^{(4)(Y)} = 3.6111123$$

$$(4)(Y) \ln(1.025) = \ln(3.6111123)$$

$$Y = \frac{\ln(3.6111123)}{(4) \ln(1.025)} = 13$$

Alex:

$$100,000(1 + 13s) = 361,111.23 \implies 1 + 13s = 3.6111123$$

$$\implies s = \frac{3.6111123 - 1}{13} = 0.2008547923$$

$$i_{10} = \frac{a(10) - a(9)}{a(9)} = \frac{s}{1 + (10-1)s} = \frac{0.2008547923}{1 + (9)(0.2008547923)} = \boxed{0.071537}$$

2. Danny agrees to pay Christine 1000 today. In return, Christine agrees to pay Danny 500 at the end of one year and 700 at the end of two years.

Determine Danny's Internal Rate of Return on the arrangement.

**Solution:**

$$1000(1+i)^2 = 500(1+i) + 700 \implies 10(1+i)^2 - 5(1+i) - 7 = 0$$

$$\text{Using the quadratic } \implies (1+i) = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(10)(-7)}}{(2)(10)} = 1.12321 \implies \boxed{i = 0.12321}$$

*OR*

Using the Calculator

$$\boxed{CF0} \leftarrow -1000; \boxed{C01} \leftarrow 500; \boxed{C02} \leftarrow 700; \boxed{IRR} \boxed{CPT} \rightarrow \boxed{12.321\%}$$

3. Calculate the  $d^{(4)}$  that is equivalent to an interest rate of 8% compounded monthly.

**Solution:**

$$\left(1 + \frac{i^{(12)}}{12}\right)^{12} = \left(1 - \frac{d^{(4)}}{4}\right)^{-4}$$

$$\left(1 - \frac{d^{(4)}}{4}\right)^{-4} = \left(1 + \frac{0.08}{12}\right)^{12} \implies \left(1 - \frac{d^{(4)}}{4}\right) = \left(1 + \frac{0.08}{12}\right)^{12/-4}$$

$$\implies \frac{d^{(4)}}{4} = 1 - \left(1 + \frac{0.08}{12}\right)^{-3}$$

$$\implies d^{(4)} = 4 \left[ 1 - \left(1 + \frac{0.08}{12}\right)^{-3} \right] = \boxed{0.07895}$$