MAP 4170 Name:_____
Test 1 Date: September 25, 2012

Show sufficient work and clearly mark your answers. Each problem is worth 10 points.

1. Eli owes Archie payments of 2000 in 1 year and 1000 in 2 years. Eli offers to make a single payment of 2610, immediately, claiming that the total present value of the 2 future payments is 2610. Determine the nominal interest rate compounded monthly that would make Eli's claim true.

   (A) 0.88%

   (B) 0.93%

   (C) 5.55%

   (D) 10.58%

   (E) 11.1%

2. At time 0, Peyton deposits an amount into an account that credits interest using a simple discount rate *d*. There were no other deposits made into the account. At the end of year 3 there is 1000 in the account and at the end of year 12 there is 1500 in the account. Determine *d*.

   (A) 3.33%

   (B) 3.57%

   (C) 3.71%

   (D) 3.92%

   (E) 4.07%

3. Betty deposits an amount at time 0 into a fund which credits interest using a simple interest rate *i*. The force of interest in the account at time 10 is equal to 0.05.

   Charlie deposits 1000 into a separate account in which interest is credited using a nominal interest rate of *i*, compounded quarterly. Determine the amount in Charlie's account at the end of 10 years.

   (A) 1645

   (B) 2685

   (C) 4065

   (D) 5830

   (E) 7040

4. Determine which of the following equations represents the correct relationship between a nominal interest rate compounded monthly and a nominal interest rate compounded quarterly.

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

   (B) $i^{(4)} = 4\left[\left(1+\frac{i^{(12)}}{12}\right)^{12}+1\right]$

   (C) $i^{(4)} = 4\left[\left(1+\frac{i^{(12)}}{12}\right)^{4}+1\right]$

   (D) $i^{(4)} = 4\left[\left(1+\frac{i^{(12)}}{12}\right)^{3}-1\right]$

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

5. A fund credits interest using an interest rate of 10% compounded every other year for the first four years, and a nominal discount rate of 12% compounded monthly thereafter. Determine the accumulated value after 8 years of a deposit of 1000.

   (A) 2320

   (B) 2330

   (C) 2340

   (D) 2350

   (E) 2360

6. At time 0, Jason deposits 500 into an account in which the force of interest is $\delta_t = \frac{0.5t}{2+t^2}$, for $t > 0$. At the end of year 4, Jason makes an additional deposit of X into the account. The amount of interest earned between years 3 and 5 is 200. Determine X.

   (A) 30

   (B) 50

   (C) 70

   (D) 90

   (E) 110

7. Determine $\frac{d}{dd}(v)$, the derivative of v with respect to d, where d denotes a periodic effective discount rate and v is the corresponding periodic discount factor.

   (A) $-v^{-2}$

   (B) $-v^{-1}$

   (C) -1

   (D) $-v$

   (E) $-v^{2}$

8. The force of interest at time t for a certain account is $\delta_t = 0.02t,\ t > 0$. Determine the corresponding annual effective discount rate for year 2 for this account.

   (A) 2.96%

   (B) 2.99%

   (C) 3.02%

   (D) 3.05%

   (E) 3.08%

9. Willie deposits 500 into an account that credits interest using a simple discount rate d for the first year and then a semiannual effective discount rate of d thereafter. At the end of 2 years, the account balance is 1000. Determine d.

   (A) 0.10

   (B) 0.15

   (C) 0.20

   (D) 0.25

   (E) 0.30

10. Determine the constant force of interest that is equivalent to an interest rate of 10% compounded quarterly.

    (A) 2.38%

    (B) 2.47%

    (C) 9.35%

    (D) 9.53%

    (E) 9.88%