

MAP 4170 – 01  
Test 2

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Problems 1-9 are worth 10 points each and problems 10-11 are worth 5 points each.  
Use correct notation.

1. You are given  $\delta_t = \frac{1}{1+t}$  for  $t > 0$ . Find  $s_{\overline{3}|}$ , if the first payment is made at  $t = 1$ .

- a. 4.00
- b. 4.08
- c. 4.17
- d. 4.25
- e. 4.33

2. A homeowner signs a 30 year mortgage that requires payments of \$971.27 at the end of each month. The interest rate on the mortgage is 6% compounded monthly. If the purchase price of the house is \$180,000 then what percentage down payment was required?

- a. 5%
- b. 10%
- c. 15%
- d. 20%
- e. 25%

3. Jim began saving money for his retirement by making monthly deposits of 200 into a fund earning 6% interest compounded monthly. The first deposit occurred on January 1, 1985. Jim became unemployed and missed making deposits 60 through 72. He then continued making monthly deposits of 200.

How much did Jim accumulate in his fund on December 31, 1999?

- a. 53,572
- b. 53,715
- c. 53,840
- d. 53,966
- e. 54,184

4. An increasing perpetuity with annual payments has a present value of 860 at an annual effective discount rate,  $d$ . The initial payment at the end of the first year is 3 and each subsequent payment is 2 more than its preceding payment.

Calculate  $d$ .

- a. .0476
- b. .0500
- c. .0526
- d. .0550
- e. .0576

5. A perpetuity-immediate pays  $X$  per year. Brian receives the first  $n$  payments, Colleen receives the next  $n$  payments, and Jeff receives the remaining payments. Brian's share of the present value of the original perpetuity is 40%, and Jeff's share is  $K$ .

Calculate  $K$ .

- a. 24%
- b. 28%
- c. 32%
- d. 36%
- e. 40%

6. The present value of the following three annuities are equal:

- i. Perpetuity-immediate paying 1 each year, calculated at an annual effective interest rate of 7.25%
- ii. 50-year annuity immediate paying 1 each year, calculated at an annual effective interest rate of  $j$  %.
- iii.  $n$ -year annuity immediate paying 1 each year, calculated at an annual effective interest rate of  $(j-1)$  %.

Calculate  $n$ .

- a. 30
- b. 33
- c. 36
- d. 39
- e. 42

7. A 10-year increasing annuity-immediate paying 5 in the first year and increasing by 5 each year thereafter has a present value of  $G$ . A 10-year decreasing annuity-immediate paying  $y$  in the first year and decreasing by  $y/10$  each year thereafter has a present value of  $G$ . Both present values are calculated using an annual effective interest rate of 4%.

Calculate  $y$ .

- a. 42
  - b. 44
  - c. 46
  - d. 48
  - e. 50
8. A 20 year annuity-due with annual payments has a first payment of 100 and each subsequent payment is 5% more than its preceding payment. Calculate the present value of this annuity at a nominal interest rate of 10% compounded semiannually.
- a. 835
  - b. 920
  - c. 1245
  - d. 1310
  - e. 1350

9. Kathryn deposits 100 into an account at the beginning of each 4-year period for 40 years. The account credits interest at an annual effective interest rate of  $i$ ,  $i > 0$ . The accumulated amount in the account at the end of 40 years is  $X$ , which is 5 times the accumulated amount in the account at the end of 20 years.

Calculate  $X$ .

- a. 4695
- b. 5070
- c. 5445
- d. 5820
- e. 6195

10. A loan of 10,000 is being repaid with payment of 300 at the end of each month for as long as necessary plus an additional payment at the time of the last regular payment.

What is the amount of the additional payment using an interest rate of 9% compounded monthly.

- a. 50
- b. 75
- c. 100
- d. 125
- e. 150

11. If  $n$  is an integer such that  $n < \frac{1}{\delta}$ , which relationship is true?

I.  $(\overline{Ia})_{\overline{n}|}$

II.  $(I^{(m)}a)_{\overline{n}|}^{(m)}$

III.  $(Ia)_{\overline{n}|}^{(m)}$

a.  $I < II < III$

b.  $III < II < I$

c.  $I < III < II$

d.  $III < I < II$

e. None of the above