

**Homework Assignment # 5 (max. points = 20)**  
**Due at the beginning of class on Thursday March 6, 2008**

Please show your work - enough to show that you understand how to do the problem. Circle your final answer. Full credit can only be given only if the answer and work leading to the answer are correct.

1. A 15-year annuity-immediate pays 100 the first year, and each subsequent payment is 10% larger than the preceding. Find the present value of this annuity three years before the first payment if the effective annual rate is  $i = 5\%$ .
2. Donna deposits money into an account at the end of every six month period for 5 years. Her deposits follow the following pattern: 500, 500,  $500(1.04)$ ,  $500(1.04)^2$ ,  $500(1.04)^3, \dots, 500(1.04)^4, 500(1.04)^4$ . If Donna's account earns  $i^{(2)} = 6\%$  annual interest, what is the accumulated value of Donna's account 3 years after the last payment.
3. You are considering the purchase of a share of stock. If you buy the share, you will expect to receive the following dividends: \$3 one year from now, \$3.50 two years from now, \$4 three years from now, and thereafter annual dividends increase by 4% per year, forever. If the effective annual interest rate is 10%, what is the theoretical price of this share of stock?
4. A perpetuity-immediate pays \$1,000 the first year, and the annual payment increases by \$100 each year thereafter. If the present value of the perpetuity is \$9,000, what is the annual effective rate of interest?
5. Find the present value of a perpetuity-immediate that makes the following payments:

Time	0	1	2	3	4	5	6	7	8	...
Payment		200	180	160	140	120	100	80	80	...

After time 7, this perpetuity continues to pay 80 forever. The effective interest rate is  $i = 6\%$ .

6. A 10-year decreasing annuity-due makes a payment of 100 at the beginning of the first year, and each subsequent payment is 5 less than the previous. What is the accumulated value of this annuity at time 10 (one year after the final payment)? The effective annual rate of interest is 5%. Note, the final payment is 55, not 5.
7. A 5-year annuity makes payments continuously at a rate  $h(t) = e^{\left(\frac{t^2}{24} + t\right)}$ . The force of interest varies continuously at a rate of  $\delta_t = \frac{t}{12}$ . Find the present value of this annuity.

For problems 8, 9, and 10, Sam borrows \$5000 from the bank at an effective annual interest rate  $i = 10\%$ . He will repay the loan with payments at the end of each year for 4 years. Create an amortization schedule for the loan similar to Tables 3.3 and 3.5

in Broverman. In each problem, indicate the total amount of all payments, the total amount of all interest paid, and the total amount of all principal repaid.

8. Create an amortization schedule where Sam repays the loan with 4 level payments.
9. Create an amortization schedule where the first payment is  $k$ , and each subsequent payment is 5% larger than the preceding payment.
10. Create an amortization schedule where the first payment is  $k$ , and each subsequent payment is \$200 larger than the preceding.