

**MATH 373**  
**Test 2**  
**Spring 2017**  
March 9, 2017

1. Huda invests 100 at the beginning of each quarter into a fund earning an annual effective rate of 8%.

Calculate the amount that Huda will have at the end of 20 years.

2. Bryan invests 10,000 at the end of each year for 18 years into the ONG Fund that pays an annual effective interest rate of 6%. At the end of each year, Bryan removes the interest from the ONG Fund and invests it in the MILES Fund. The MILES Fund pays an annual effective interest rate of 7.5%.

Calculate the amount that Bryan will have at the end of 18 years if he combines the amount in the ONG Fund with the amount in the MILES Fund.

3. Sam will begin receiving continuous annuity payments today. The annuity pays at a rate of  $t^3 + 8t$  at time  $t$  for the next 13 years.

Using a discount function of  $v(t) = 1 - 0.04t$ , calculate the present value of Sam's annuity.

4. Muzhi has a loan with 20 annual payments. The first 10 payments are 11,000. The payment at the end of the 11<sup>th</sup> year is 10,000. The payment at the end of the 12<sup>th</sup> year is 9000. The payments continue to decrease until a payment of 1000 is paid at the end of the 20<sup>th</sup> year.

The interest rate on the loan is an annual effective interest rate of 7.5%.

Calculate Muzhi's outstanding loan balance at the end of 16 years right after the loan payment of 5000 is paid.

5. Molly borrows 16,000 to buy a new car. The loan has an interest rate of 12% compounded monthly and will be repaid over 60 months. Molly makes all the payments required by the loan. However, she accidentally paid the 15<sup>th</sup> payment twice without realizing it.

Calculate the outstanding loan balance on Molly's loan right after she makes the payment at the end of the 24<sup>th</sup> month.

6. Wendy is the beneficiary of an annuity immediate with quarterly payments for the next 15 years. The four payments in the first year of the annuity are each 15,000. The four payments in the second year are each 14,000. The payments continue to decrease until the four payments in the 15<sup>th</sup> year are 1000 each.

Calculate the present value of this annuity using an interest rate of 10% compounded quarterly.

7. Tom is receiving a perpetuity due of 1000 at the beginning of each year. At an annual effective interest rate of  $i$ , the present value of the perpetuity is 13,500.

James invests 800 into a fund at the beginning of each year. The fund earns an annual effective interest rate of  $i$ . After 10 deposits, James stops making deposits but leaves his money invested in the same fund.

How much does James have at the end of 20 years?

8. Frankie is the beneficiary of a trust fund. The trust fund will pay Frankie monthly payments at the end of each month for 10 years. Each payment the first year will be 100. Each payment the second year will be 200. The payments will continue to increase until each payment will be 1000 during the last year.

Calculate the present value of Frankie's annuity using an annual effective interest rate of 6%.

9. Mingyu is repaying a loan with 20 quarterly payments. The interest rate on the loan is 6.8% compounded quarterly. The first payment is 10,000. The second payment is 12,000. The third payment is 14,000. The payments continue to increase with each payment being 2000 greater than the prior payment.

Calculate the amount of the loan.

10. Natasha has the choice of the following two continuous annuities both with payments for 22 years:

a. A continuous annuity that pays at a rate of  $X$  per year.

b. A continuous annuity that pays at a rate of  $50t$  at time  $t$ .

If  $\delta = 0.05$ , these two annuity options have the same present value.

Calculate  $X$ .

11. Dayton is receiving an annuity due with annual payments for 32 years. The first payment 8000. The second payment is  $8000(1.04)$ . The third payment is  $8000(1.04)^2$ . The payments will continue to increase with each payment being  $(1.04)$  greater than the prior payment.

At an annual effective interest rate of 5%, calculate the accumulated value of Dayton's annuity at the end of 32 years.

12. Wang Company borrows 100,000 which will be repaid with annual payments of 12,000 plus a balloon payment. The interest rate on the loan is an annual effective rate of 7%.

Calculate the amount of the balloon payment.