

## Exam 2 Review Problems

Exam 2 Rev(A): An annuity begins annual payments January 1, 2018. The first two payments are \$1000. Subsequent payments increase by \$100 every year for the next 10 years (12 total payments, with the last payment of \$2000 on January 1, 2029.) What is the value of this annuity on January 1, 2017, assuming an annual effective interest rate of 4%?

Exam 2 Rev (B): Sam borrows \$25,000 agreeing to pay an annual effective interest rate of 8% at the end of each year for 6 years. In addition, Sam must make annual equal deposits into a sinking fund that earns 5% effective so that this fund will be able to repay the principal at the end of 6 years. Find the interest payment, sinking fund deposit and the total payment (interest + sinking fund deposit) that is due at the end of each year.

Exam 2 Review (C): Jane buys an annuity that begins today. It pays \$1000 at the beginning of every month for the first year. Every year thereafter payments increase by 2% but monthly payments are level within each year. Payments stop after 5 years. At 4% annual effective interest rate, what does the annuity cost?

Exam 2 Rev (D): Consider an annuity making continuous payments with rate of payment function

$$f(t) = \begin{cases} 3(t+5)^3 & \text{for } 0 \leq t \leq 5 \\ 0 & \text{elsewhere} \end{cases}$$

and accumulation function

$$a(t) = \frac{(t+5)}{5} \quad \text{for } t \geq 0.$$

Find the present value of this annuity.

Exam 2 Rev (E): A borrower is repaying a loan with annual payments of \$2000 at the end of each year for an unknown period of time. If the amount of principal on the 2<sup>nd</sup> installment is \$823.97, find the amount of interest on the 5<sup>th</sup> installment. Assume the nominal annual interest rate is 6% convertible semiannually.

Exam 2 Review (F). An investment pays \$1000 at the end of years 2, 3 and 5. The effective annual interest rate through the first two years is 4% and it is 5% after that. Find the present value of these payments (a) by the portfolio method and (b) by the yield curve method.

Exam 2 Review (G) A five year bond has a 10% annual coupon rate for its semiannual coupons and a redemption value of \$1,000. It is designed to achieve a yield of 8% convertible semiannually. What is the price of this bond?

Exam 2 Review (H) Payments on a continuous perpetuity are made at a rate of  $(1+k)^t$  at time  $t$ . The annual effective interest is  $i$ , where  $0 < k < i$ . Find the present value of the perpetuity.