Math 1300 Fall 2013
Friday August 23 2013
Exercises

1. At the end of each quarter year, for 6 years, \$1200 is deposited into an investment paying 3.4% interest compounded quarterly. What is the future value of this increasing annuity?

Solution:

2. You deposit money at the end of each week into an investment paying 2.6% interest compounded weekly. How much was this regular deposit if you have $\$16,382.52$ at the end of three years?

Solution:

3. You withdraw a fixed amount of money at the end of each half year, for 5 years, from an account that pays 1.8% interest compounded semiannually. At the end of the fifth year, the account has a zero balance, and had a balance of $\$57,781.39$ at the beginning. How much did you withdraw each time?

Solution:

4. Would you rather receive a lump sum of \$9000 at the end of 3 years, or would you rather receive \$750 at the end of each quarter year for 3 years, if you can earn 2.2% interest compounded quarterly?

Solution:

5. Suppose that on January 1, 2009, you deposited \$100 into a savings account. In 2011, you began depositing \$10 into the account at the end of every month. If the account pays 2.7% interest compounded monthly, how much will you have on January 1, 2015?

Solution:

6. A bond pays 4% interest compounded semiannually on its face value of \$5000. The interest is paid at the end of every half year period. Fifteen years from now, the face value of \$5000 will be returned. The current market interest rate for bonds is 3% compounded semiannually. What is the bond worth?

Solution:

7. By winning a lottery, you will receive \$1000 a month for the next 5 years. If interest rates are 1.8% compounded monthly, how much is this sequence of payments worth today? Why would the lottery prefer to pay the \$60,000 in monthly installments over 5 years rather than pay it as a lump sum today? How much does it gain by doing this?

Solution: We are valuing a sequence of $n = 5 \times 12 = 60$ payments of $R = \$1000$ each, when we have access to an account paying .018 per year, or $i = .018/12 = .0015$ per interest period (which is a month).

Using the formula

$$PV = \frac{R(1 - (1+i)^{-n})}{i},$$

we get that the present value is $\$57,338.12$.

The lottery benefits by paying the $\$60,000$ in monthly installments because it needs less money today to pay this amount over time, as compared to making one lump sum payment of $\$60,000$ today. In fact, it saves $\$60,000 - \$57,338.12 = \$2,661.88$ today by doing so.

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8. Your company is investing in a sinking fund to replace a warehouse 5 years from now. The warehouse costs \$8 million to replace today, but this estimate will increase by 5% every year. The sinking fund earns 3.6% interest compounded monthly. How much should you pay into the fund every month in order to be able to afford the replacement?

Solution: