Fin. Math. Assignment 2

Due on Oct. 15. 2024. 17: 00

1. Ernie makes deposits of 100 at time 0, and X at time 3. The fund grows at a force of interest $\delta(t)=\frac{t}{100}, t>0$. The force of interest earned from time 3 to time 6 is X, calculate X.

2. On 1/1/97 Kelly deposits X into a bank account. The account is credited with simple interest at the rate of 5% per year.
   On the same date, Tara deposits X into a different bank account. The account is credited interest using a force of interest
   $$\delta(t)=\frac{1}{t+k}.$$
   From the end of the 4th year until the end of the 8th year, both accounts earn the same dollar amount of interest.
   Calculate k.

3. A deposit of 100 is made into a fund at time $t=0$. The fund pays interest at interest rate of r compounded annually for the first two years.
   Beginning at time $t=2$, interest is credited at a force of interest $\delta(t)=\frac{1}{t+1}$. At time $t=5$, the accumulated value of the fund is 260.
   Calculate r.

4. You are given $\delta(t)=\frac{2}{t+1}$ for $t\geq 0$.
   What is the equivalent constant continuous compound rate at the end of 5th year?

5. A stock price is currently 80. It is known that at the end of one month it will be either 84 or 76. The interest rate is 8% per annum with continuous compounding. What is the value of a one- month European call option with a strike price of 78?

6. A stock price is currently 100. It is known that at the end of six months it will be either 90 or 110. The interest rate is 10% per annum with continuous compounding. What is the value of a six-month European put option with a strike price of 100?

7. A stock price is currently 200. Over each of the next two six-month periods it is expected to go up by 10% or down by 10%. The interest rate is 8% per annum with continuous compounding. What is the value of a one-year European call option with a strike price of 200?

8. A stock price is currently 200. Over each of the next two six-month periods it is expected to go up by 10% or down by 10%. The interest rate is 8% per annum with continuous compounding. What is the value of a one-year European put option with a strike price of 200? Verify that the European call and European put prices satisfy the put-call parity formula.