Test 1

Name:

Derived points:

Problem 1. Consider the Black-Scholes model and the derivative asset:

$$X = \begin{cases} K & S_T \leq A, \\ K + A - S_T & A < S_T < K + A, \\ 0 & S_T > K + A. \end{cases}$$

Replicate this derivative using portfolio consisting of bond, asset S and European call option. Find the arbitrage free price for X.

Problem 2. Find the arbitrage free price of $X = S_T/S_{T_0}$ for Black-Scholes market with expiry date T.

Problem 3. Why is the market consisting with one asset and one risk-free instrument in the Black-Scholes model complete?

Problem 4. Let some financial instrument F has delta Δ_F and the delta of our portfolio equals Δ_P. How many units of the derivative F should be added to our portfolio to make this portfolio delta neutral?

Problem 5. Find the arbitrage free price of $X = \mathbf{1}_{\{S_T > S_{T-1}\}}$ for Black-Scholes market with maturity $T > 1$.