This document contains 2 questions.

1. [default,O1]

   Consider a single-period financial model with interest rate $r = 1/10$, where one can trade a stock at the price $S_0 = 100$, the forward contract on the stock, and the call option on the stock with the strike $K = 110$ at the price $C_0 = \frac{70}{11}$. Assume that the forward price of the stock is $F = 110$, and that the stock price S_1 at maturity takes the following possible values: $70, 90, 110, 130$. A model is said to be *complete* if every derivative is replicable in such model. Answer the following questions and justify carefully with either proofs or counterexamples.

   (a) Is this model arbitrage-free?

        A. No   B. Yes

   (b) Is this model complete?

        A. No   B. Yes

   (c) What is the smallest price at which an infinitely risk-averse investor would sell the put option with strike $K = 110$?

        A. $\frac{80}{11}$ B. $\frac{70}{11}$ C. None of the above

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2. [default,O29]

   Consider the following model with two stocks and a bank account with interest rate is $r = 1$. The prices at time $t = 0$ equal to $S_0^1 = 5$ and $S_0^2 = 5$. The prices of the two stocks at time $t = 1$ are given by the following vectors:

   $$S_1^1 = \begin{pmatrix} 12 \\ 12 \\ 8 \\ 6 \end{pmatrix} \text{ and } S_1^2 = \begin{pmatrix} 16 \\ 8 \\ 6 \\ 4 \end{pmatrix}.$$

   Is this model free of arbitrage?

   A. No   B. Yes

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