Computer problems 02

1. In Microland, N individuals live with different utility functions that depend on the quantity of two goods consumed. Each period, people's disposable income changes, which leads to a change in the demand for goods. Assuming that the supply in the country increases by M% each period, determine the equilibrium points, as well as the Paasche and Laspeyres indices in dynamics. Develop the conditions for the functioning of such an economy, graphically plot the change in parameters in dynamics over L periods. Propose a model to describe the changes in parameters.
2. Imagine that there are two groups of consumers, group A and group B. Each individual in the group has a utility function that depends on the quantity of the goods he buys and on the price of the goods. The price of the goods at each step is set by the seller, but is different for each group of consumers. In addition, each individual has a certain income that he can spend on the purchase of goods. At each step, the income of each individual depends on his earnings, which is determined randomly according to a distribution with certain parameters. Group A has a higher average income than group B, but it also has a higher volatility in its income distribution. At each step, group B has a certain probability of increasing its income by a certain percentage, which is set in advance. Group A does not have this possibility. You should create a simulation model of this economy and investigate how the difference in income and the possibility of increasing income affects the purchases of goods and the total utility of each group.
3. There is a pension system in the economy. There is a generation of individuals who have certain incomes and pay a certain contribution to the pension fund. Each individual from this generation has the opportunity to choose one of two strategies: "save" (keep their contribution in their bank account) or "spend" (use their contribution for current needs). In addition, there are two generations in the economy: "young" and "old". "Young" individuals work and pay contributions to the pension fund, while "old" individuals are already retired and receive payments from this fund. Prices for goods and services in the economy are constantly growing by a certain amount, given by the distribution specified by the user, so the real value of contributions decreases over time. At the same time, at each step, the share of contributions that an individual pays for "savings" or "spending" may change depending on the level of income and other factors. The simulation should take into account generational change, different choices of "savings" or "spending" strategies, and the effect of inflation on the real value of contributions. The aim of the simulation is to assess the sustainability and efficiency of the pension system in the long term.