Consider the problem of assigning $N$ workers to $K$ work teams. Suppose that your goal in this assignment is to maximize the total output of the $K$ teams. Suppose each worker possesses an ability level $a_n$ which is unaffected by the assignment. Each worker also chooses an effort level $e_n$ based upon the compensation rule that each worker receives an equal share of the output of a given team.

In answering this question, add assumptions as needed.

A. Describe this problem formally.

B. Are there conditions under which workers are segregated across teams by ability? How does this relate to the literature on assortative matching?

C. How would your answer to B. change if your goal as a planner is to maximize the minimum output share received by any worker?
**Problem #2 “Uncertainty and Investment”**

A firm has to decide when to invest in an indivisible project. Once the investment is made -- and it costs $k > 0$ units of consumption to get the project going -- the project yields a flow of benefits of $x_i \pi$ units of consumption per period, where $x_i$ is an i.i.d. non-negative random variable with bounded support in $[0, B]$, and cdf $F(x)$. The expected value of $x_i$ is $\bar{x}$. If the firm decides not to invest, it still retains the right to invest the following period. The firm maximizes expected discounted profits. Thus, if it invests at time $t$, when $x_t = x$, profits are:

$$\Pi(x) = E_r \Sigma_{t=0}^{\infty} \beta^t x_t \pi - k = \pi \left[ x + \beta \bar{x}/(1-\beta) \right] - k = \left[ \pi/(1-\beta) \right] [x(1-\beta) + \beta \bar{x}] - k.$$ 

Assume that there is a value of $x$, $\bar{x} < B$, such that $\Pi(x) > 0$, whenever $x > \bar{x}$.

i) The firm hires two economists to advise it on this investment problem. Economist A claims that profits are maximized investing in projects with positive net expected present value. Thus, he/she claims that the firm should invest whenever $x \geq \bar{x}$. Since $\Pi(\bar{x}) = 0$, it follows that $\bar{x}$ is the unique solution to

$$\left[ \pi/(1-\beta) \right] [\bar{x}(1-\beta) + \beta \bar{x}] = k.$$ 

Economist B asserts that profit maximization requires to take into account the option value of not investing today; that is, the “value of waiting.” He/she claims that the value of the project (this is really the value of having the option to invest) when $x_t = x$, which we denote $V(x)$, satisfies,

$$V(x) = \max \{ \Pi(x), 0 + \beta \int_{\bar{x}}^{B} V(x')F(dx') \}.$$ 

Economist B claims that the solution to this problem is to invest whenever the value of $x_i$ exceeds $x^*$, and that $x^* > \bar{x}$. Either prove or disprove Economist B's claim.

ii) Let $F(x;r)$ be a family of distributions on $[0, B]$ indexed by $r$. If $r' > r$ then $F(x;r')$ is “riskier” (in the second order stochastic dominance or mean preserving spread senses) than $F(x;r)$. Show that an increase in $r$ does not affect Economist A’s advise, but that it does change the criterion advocated by Economist B.

iii) Let $T$ be the random variable “Number of Periods Until the Project is Implemented.” Let $E[T]$ be the mean of $T$. Show that an increase in uncertainty in the mean preserving spread sense induces delay in the implementation of projects that follow the advise of Economist B. Why?

iv) Who do you think is correct: Economist A or B? Justify your answer.
In recent discussions of monetary policy, some individuals have recommended that monetary policy be guided by a “Taylor Rule” in which the nominal federal funds rate target in time $t$ is determined by the following equation:

$$R^f_t = (GDP \text{ percentage inflation rate})_t + 2.0 + 0.5((GDP \text{ percentage inflation rate})_t - 2.0) + 50((\text{Real GDP} - \text{Potential GDP})/\text{Potential GDP})_t$$

Interpret and critically assess this recommendation. What pragmatic difficulties are there in implementing such a rule? Under what conditions would it be an optimal control rule? When would employing such a rule be harmful to an economy? What relation does it have to earlier proposals that (1) the Federal Reserve should have some money aggregate grow at a constant geometric rate and (2) to Wicksell's suggestion that nominal interest rates should be set equal to the ”natural rate of interest”? Would it matter if the economy was open and there was perfect capital mobility? Answer each question, being careful to state any assumptions that you require.