midterm, due November 28.

Do problem 1 and do two problems chosen from 2, 3, and 4.

1. A function $f(k,h)$ gives the quantity of corn that can be produced using k units of seed corn and h units of labor. For each of the functions

$$f(k,h) = \min\left[a^{-1}k, l^{-1}h\right]$$

$$f(k,h) = kh$$

$$f(k,h) = k^{\alpha}h^{1-\alpha}.$$

find the combination of corn and labor that minimizes the cost of producing y units of corn when the corn wage is w, and express this minimum cost as a function of y and w.

2. Each of N workers has a unit of labor power. Each of 15 capitalists has 10 units of corn. To produce a unit of corn capitalists can commit .5 units of seed corn and hire 1 unit of labor with wages paid at the end of the period. Unemployed workers get a dole of .3 units of corn paid for by a tax on profits. Capitalists and workers act to maximize the corn they hold at the end of the period.
(a) Let $N = 400$. Find a corn wage such that there is no unemployed worker and no capitalist with unused seed corn who would both agree to a different wage. How many workers are employed by the capitalists? What is the capitalists' rate of profit before taxes? After taxes?
(b) How much labor is embodied in the wage you found in (a)? Is there Marxian exploitation in that equilibrium?
(c) Repeat (a) and (b) with $N = 200$.

3. (from Jean-Paul Sartre, *Critique of dialectical reason.*) Some landlords own land along a river. There are 100 very fertile plots directly on the riverbank, and 100 less fertile plots set back from the river. Each plot on the bank yields 2 units of corn, and each inland plot yields 1. If more than 50 of the plots on the bank are cultivated, the bank is washed away and the harvest of all 100 riverside plots destroyed.
(a) Renting land from the landlords at given rental rates, farmers choose production plans to maximize their harvest net of rental payments. Find the Walrasian equilibrium rental rates of fertile and infertile plots in terms of corn.
(b) What is the maximum feasible output of corn? Is this harvest achieved in the equilibrium you just described?

4. Explain the hypothesis that prices determine the production decisions of price-taking, profit-maximizing firms. What problems does this hypothesis face in the case of increasing returns to scale? And with decreasing returns to scale? What about constant returns to scale?