This is an exam. **That means you cannot ask other people for help regardless of whether or not they are in the class. You cannot look at the work of other people.** Your only resources are your notes, the help sheets on the web, any book you want to use, and me. However, I probably won't be of much help, even though I know the answer. There is no time limit on the amount of time spent on this exam. You can spend as much time as you want on it, providing you turn it in by the **start** of class next Tuesday. (So you really have a time limit of 10,080 minutes minus the time you have already wasted before you read this.) There are 200 points and it is worth 20% of the 1000 points for the semester.

Do not write your name on the assignment. Write your name only on the back of this sheet of paper and staple your answers on the front of this sheet of paper. Failure to follow these directions will cost you 1 point on the exam.

1) (5 points) Suppose that an utility function is given by $U(X,Y,Z) = X^{-1/2}Y^{1/2}$. What transformation of that function would you like to do before you maximize utility? Can you do that? Why or why not?

2) (5 points) We said that the Cournot's model was a Nash model and that Von Stackleberg's was not. The Bertrand model has the two firms deciding what their price should be and both firms assume that the other firm's price is fixed. Is that a Nash model? Explain your logic.

3) (10 points) Why can't a utility function be given by $U = \dfrac{8Y^{1/3}}{X^3}$? Explain your logic.

4A) (30 points) Suppose that in a Cournot duopoly, both firms are facing a total cost function of $TC = 5 + 4Q + Q^2$ and both firms face a demand function given by $P = 444 - 3(Q_1 + Q_2)$. Find the equilibrium values for the two outputs, price, and profits. Show enough work that I can follow what you are doing.

4B) (5 points) What was firm #2's best response function? Why is it called that?

4C) (30 points) Suppose that firm #1 in the above question realizes what is happening and decides to be a Von Stackleberg Leader. Find the new equilibrium outputs for the two firms. Do not worry about the prices or profits. Show enough work that I can follow what you are doing.

5) (30 points) Suppose that your utility function is given by $U = B^{1/3} + 2F^{1/3} + G^{1/3}$. Bananas cost $2/bunch, frisbees cost $4/frisbee, and gasoline costs $8/gallon. You have $56 to spend on them. How much of each will you buy, and what is your total utility? If you had an increase in your income by about $1, how much would your utility go up? Show enough work that I can follow what you are doing.

6) (35 points) Suppose that you want to save as much as possible for retirement, but you want to have a current minimal utility of 8. Your utility function is given by $U = \sqrt[3]{B * C}$ and beef costs $8/lb while chicken costs $1/lb. What is the most that you need to spend on this unhealthy diet? Show enough work that I can follow what you are doing.

7A) (40 points) Suppose that a firm has a production function of $Q = 7K^{2/7}L^{3/7}$. The cost of labor is $3/L and the cost of capital is $2/K. Find the total cost function. Show enough work that I can follow what you are doing. Do not find λ.

7B) (10 points) Find the marginal and average cost functions. Show enough work that I can follow what you are doing.