Write your name on the cover of the test booklet and nowhere else. Failure to follow these directions will cost you 1 point. The test has 150 points (to be scaled up to 200 points) and is scheduled to take 75 minutes. Therefore, expect to spend 1 minute for every 2 points. For example, a 16-point question should take 8 minutes. I cannot give extra time because some of you have a class after this one.

Show all work on all questions.

1) (8 points) Do EITHER Part A OR Part B.
A) Why do we use Lagrangians to do the Von Stackleberg Model, but not in the Cournot Model?
B) Is the $U(x, y, z) = x^{1/3}y^{1/3}z^{1/3}$ a legitimate utility function? Explain your logic.   If it fails a test, you only need to show that failed test.

2) (10 points) Do EITHER Part A OR Part B.
A) If $TC = 40Q^2 - 3Q + 4Q^{1/2}$, then find ATC and MC.
B) Suppose your utility function is given by $U = 16B^{1/4}G^{1/2}H^{1/4}$. The price of bananas is $2/lb, the price of grapes is $4/lb, and horseshoes cost $2 each. Suppose the amount of time to purchase each product is 1 hour/item and you have 36 hours to purchase them. Set up the Lagrangian to find your utility maximizing level of consumption of bananas, grapes, and horseshoes if your income is $96. **Do NOT solve this problem. Just set it up and explain what you did.**

3) (24 points) Find all Nash equilibria in the following matrix. Prove that you found all and prove they are Nash equilibria. Find the cooperative solution. Explain how you found it. Find both player's safe (secure) strategy. Explain how you found it.

Payoff Matrix		Browns		
		Expensive Tickets	Medium Priced	Cheap Tickets
Steelers	Expensive Tickets	10 17	13 15	12 4
	Cheap Tickets	9 12	7 16	14 6

4) (30 points) Suppose that both firms are facing the following demand and total cost functions: $P = 100 - (Q_1 + Q_2)$ and $TC_i = 10 + 4Q_i + \frac{1}{2}(Q_i^2)$. Use this to derive the best response function for Firm 1 and the equilibrium output for each firm, assuming that the firms are Cournot style firms. What are the outputs and profits of the two firms and the market price? Show all work.

5) (36 points) Suppose that labor costs $4/unit and capital costs $16/unit and the firm's production function is given by $Q = K^{1/6}L^{1/3}$. Derive formulas for the total cost for an output of Q. <u>DO NOT</u> calculate the value of λ. Show all work.

6) (42 points) Suppose your utility function is given by $U = 3F^{1/3}G^{1/3}$. The price of flowers are $16/flower and the price of a gerbil is $54/each. Find the utility maximizing level of consumption of flowers and gerbils if your income is $864. **What is the value of λ?** How much utility do you have? Suppose your income went up to $870, then approximately how much would your utility go up?