First problem set for ECO 4401. Hey, wait, there's no math here! That's not fair!!! Have the first half ready for Wednesday, in case we have time to go over (some of) them then; the second half we'll do on Friday.

"You Don't Know" means there isn't enough information given in the question to allow you to answer it.

First Half.

G5. Fir and spruce are two hardwoods that are used for basically the same kinds of things--building furniture, Christmas trees, etc. Both are sold in competitive markets.

a) Let us imagine that a beetle infestation wipes out a lot of fir trees but leaves the spruce untouched. Draw two graphs to demonstrate how this would affect the prices and quantities sold of spruce and fir over the next few months. Identify clearly which way the curves are shifting.

b) We know that there are two "laws" that are supposed to hold in a competitive industry: 1) $P \geq MC$ and 2) $P = \min ATC$. Which one does not hold here?

After prices have reached their new equilibrium level Congress becomes outraged at the high price of fir, and enacts a price ceiling on fir.

c) Draw a graph to show the effect of the price ceiling. Is there excess supply or excess demand? Label it on the graph. Also identify the amount of producer surplus on the graph.

d) Has the total amount of gains from trade (in fir) increased or decreased as a result of the price ceiling? Explain, using the graph.

e) How the price ceiling on fir affect the price and quantity of spruce sold? Draw a graph for spruce and show the effect of the price ceiling on the graph. Remember, there is no price ceiling in spruce, just in fir.

R1. The Leon County Public Library has an interesting way of charging for parking. The first hour is free, then the price for each additional hour is higher than for the hour before it. So it costs $1.00 for the second hour, and $2.00 for the third hour, and $3.00 for the 4th hour, etc. (The price a total of 4 hours of parking would be $6.00.)

Most parking garages use a different set of charges. The first hour of parking is the most expensive, then the price for each additional hour of parking is less than for the hour before it. So it might cost $3.00 for the first hour of parking, $2.00 for the second hour, $1.00 for the third hour, and free for every additional hour. (The price of a total of 4 hours of parking would also be $6.00.)

a) In general, which scheme makes more money?

b) Will customers park more hours under the first scheme or the second?

c) Under which scheme will consumers have more consumer surplus?

G14. My friend is a regulator for the FTC. He regulates X corporation. You do not know anything about the industry X is in. Being a mean-spirited sort, he decides to try to lower the total profit of this corporation. So he looked at a graph of X's cost structure, below, and he found the point where the demand curve for the firm's product intersected the firm's marginal cost curve. At that point the quantity is 500 units, as seen below:

He then set a quantity limit, specifying that X corporation could sell no more than 450 units. Then, after observing X corporation, he found that they actually sold only 350 units! My friend was ecstatic! He said, "That must mean my quantity limit worked very well."

a) Give me an alternate interpretation of what happened. Illustrate, using the graph, how the X corporation decided how much to produce. Be clear and complete.

b) Identify on the graph the price the X corporation charges.

My other friend says, "Rather than set a maximum quantity at 450, you could set the price at 10. Then the producer will make 450 units, and his profit will be lowered."

c) Will the producer make 450 units? Answer: Yes, No: they will make more, No: they will make less.

d) Will this lower X corporation's profit? Answer: Yes, No, It Won't Change It, You Don't Know.

e) What other important, observable, unexpected outcome will occur?

My third friend says, "X corporation is not in a perfectly competitive market. Therefore, X corporation will earn a positive economic profit in the long run."

f) Is the X corporation in a perfectly competitive industry (market)? Answer: Yes, No, You Don't Know.

g) Will the X corporation make a positive economic profit in the long run? Answer: Yes, No, You Don't Know.

h) One theme of this course has been self-interest on the part of producers. The idea that self-interest on the part of individuals can have beneficial consequences for society as a whole is known as ______________________________. How does X corporation's self-interest affect allocative efficiency?

G12. This is a discrimination question for the 90's. Employer discrimination against homosexuals is not prohibited under the 1964 Civil Rights Act; Cracker Barrel restaurants, for example, do not hire (known) homosexuals, and their policy was recently upheld in court. For the purposes of this question, let us suppose that employers can identify which job applicants are homosexual and which are heterosexual.

Draw the labor demand and supply curves for the restaurant industry. Because restaurants like Cracker Barrel exist, homosexuals are discriminated against in employment. Heterosexual workers earn higher wages than homosexuals of equal ability. The horizontal axis measures the number of workers; the vertical axis, the yearly salary paid to each employee.

To address the discrimination problem, the Clinton administration proposes that heterosexual restaurant workers be taxed $100 per year. The worker pays the tax.

a) How does this affect the yearly salary and the employment of heterosexuals? Demonstrate on the graph. Identify the new employment level and the before- and after-tax salary. Does the tax operate to offset the effects of discrimination?

b) How does this affect the yearly salary and employment of homosexuals? Demonstrate on the graph. Identify the new salary of homosexuals as w'.

c) If the goal of the tax is to decrease the after-tax wage of heterosexuals, will that happen more when their labor demand curve is elastic or inelastic? If the goal of the tax is to decrease the employment level of heterosexuals, will the happen more when their labor demand curve is elastic or inelastic? Would more prejudiced employers lead to more or less elastic labor demand curves for heterosexuals and homosexuals?

My friend says, "An alternative to this whole tax thing would simply be to require that homosexuals be paid a salary of w'. Then the wages and employment of homosexuals would be the same as if you used the tax. Furthermore, this would also have side effects in the heterosexual labor market that would help offset the effects of discrimination." To answer the questions below, demonstrate on graphs.

d) Is my friend right about the homosexual labor market? If she is not, tell me what is wrong with her statement.

e) Would my friend's scheme offset the effects of discrimination in the heterosexual labor market? Analyze the effects on both wages and employment.

<u>Second</u> <u>Half</u>. These are mind blowers, so get started early.

R4. Janice needs a 2.5 GPA to maintain her scholarship. She currently has a 3.4 GPA. After taking microeconomics her GPA drops to 3.3. Did taking microeconomics help her or hurt her in trying to keep her scholarship, or do you know?

R3. A relay race is being held on the St. Marks Trail, which is 31 miles long. This is a different kind of relay race. Each team has four members, but each member does not have to run the same distance. Instead, each team can choose how far each member runs, so the faster people would run a longer distance than the slow people. (But everyone is in pretty good shape, so every member will run at least some distance.)

Assume the team captain knows exactly how fast each member is at every distance. How should he choose how far each team member runs?

R8. My grandparents were profit maximizing farmers. They grew wheat from seed, insecticide, and fertilizer. Let's imagine that, after grandpa has already ordered his seed, insecticide, and fertilizer for the year, I walk up to him and give him $5, to be spent on seed, insecticide, or fertilizer (just one of the three), keeping the amount of the other two the same.

a) Which commodity should he buy?

b) What is the value of the wheat produced from the extra seed, insecticide, or fertilizer?

Problem Set 2, ECO 4401. Unconstrained optimization. We will go over these on Monday, Sept. 12.

This and future problem sets will be divided into two parts. The first part is primarily mechanical, while the second part is more applications oriented, with questions that are more involved. While both kinds of questions will appear on your exams, I wish to emphasize the second part in the homework sessions, if only because the answers to the first part can generally be found in the back of your book.

Readings for this quantum of material are: Sections 1.4 and 2.2-2.6. Ignore anything to do with second-order conditions. The rest of Chapter 1 is overly complicated and I wouldn't both reading it at all, except maybe for some of the examples.

First Part. These are out of your book.

Ch. 1, do problems 1-5, 13-15, 17-19.

Ch. 2, do problems 6-11, ignoring the second-order conditions.

Second Part.

S1. In problem R3 of your previous homework assignment, the coach was trying to minimize the time it took his four runners to traverse the 31 mile St. Marks trail. The coach's job was to choose how far each team member runs.

My team has four runners: Field, Alan, Kevin, and Jeb. I actually was a high school cross country coach in New Orleans, La., and these were the names of four of my varsity runners. Like you care. Anyway, the following functions give the total time it takes each runner to travel a distance X. T is measured in hours and X in miles (1760 yards).

Field: $T_f = X^2 / 10$.
Alan: $T_a = X^2 / 20$.
Kevin: $T_k = X^3 / 48$.
Jeb: $T_j = X + 3$.

a) What two unrealistic properties does Jeb's function have?

b) Let the distance Field runs be X_f, the distance Alan runs be X_a, and the distance Kevin runs be X_k. Express the distance Jeb runs in terms of X_f, X_a, and X_k.

c) Determine how far each runner should run to minimize the total time (of the relay). Use the result of b).

d) Assume that a step has a length of one yard. Then, how would you calculate (approximate) the additional time it would take for, say, Field to run an additional step (beyond what they have been assigned to run)? Hint: use the differential.

e) In the next question, you will be asked to fill out a table, listing the total time, average time, and the time required to run an additional step, for each runner. What relationships do you expect to find between the various runners': total times, average times, and times required to run an additional step? Answer this question before proceeding to part f).

f) Fill out the first three empty columns of the table below.

Runner	Total Time	Avg. Time	Time for Add. Step	Recip. of Avg. Time
Field				
Alan				
Kevin				
Jeb				

g) Fill in the last column of the table. What is a more common name for the quantity entered in the last row (rather than recip. of avg. time)?

S2. In the game we played the first day of class, the squash producers' total cost function was $TC_s = 5 + 0.5*S*(S+1)$, and the corn producers' total cost function was $TC_c = 25 + 0.5*C*(C+1)$, where S and C represent the amount of squash and corn produced, respectively.

a) Compare the total costs from these formulas with the numbers on the sheets to verify that the formula is correct.

b) Derive the marginal cost function.

c) Compute, using the differential, the marginal cost of units 4, 7, and 10, and compare these values to the values on the sheet I handed out in class. Why are they different? This is a tough question.

d) Derive the average cost function.

Now, temporarily, ignore the consumer side of the market.

e) What quantity is maximized or minimized in the long run (in a competitive market)?

f) What will the price of squash be in the long run?

g) What will the price of corn be in the long run?

h) Now reconsider the consumer side of the market. What will happen to the squash producers?

Problem Set 4. Inequality constrained optimization. We will go over these on Mon., Sept. 26. Sections 3. - 3. are relevant for this stuff.

Your test will be held Wed., Sept. 28, as scheduled. Partly because of time constraints, and partly because I am disappointed in the effort you (as a class) are putting out on the harder homework problems, the test will consist either mostly or solely of "Second Part" style word problems.

First Part:

Ch. 3, problems:

Second Part:

S5. I have copied over the original problem in S1 and S3 over for you below.

A coach is trying to minimize the time it will take his four runners to traverse a 31 mile race course in the Apalachicola National Forest. The coach's job is to choose how far each team member runs.

The team has four runners: Field, Alan, Kevin, and Jeb. The following functions give the total time it takes each runner to travel a distance X. T is measured in hours and X in miles (1760 yards).

Field: $T_f = X^2 / 10$.
Alan: $T_a = X^2 / 20$.
Kevin: $T_k = X^3 / 48$.
Jeb: $T_j = X + 3$.

There is a new rule for the relay. The first two runners, and the last two runners, each must run the same total distance, in this case 15.5 miles each.

You'll need a calculator to get the numerical answer to most of these questions below. Be sure to use it, and write the answer down to a couple of decimal points. As you work these problems, check to see that these answers make sense. Also recall the answers to the unconstrained problem S3.

a) Write down the objective function and the constraints. How many constraints are there?

b) Solve for the distance each of the four runners must run. Use the method of Lagrange Multipliers.

c) How does the principle of equating across margins apply here?

d) Graphically depict the optimization problem facing Field and Alan in a manner similar to the indifference curve analysis you learned in intermediate micro. There are curves here analogous to both the indifference curve and the budget constraint. Compare the "budget constraint" in this problem to the similar one in the unconstrained problem.

f) After the coach has made his plans, a race director comes to him and says that the course is actually a little bit longer than 31 miles, so that one set of runners is allowed to run a little longer than 15.5 miles. (The St. Marks trail is in fact about 200 yds. longer than 31 miles.) Which set will it be?

g) Make up a constraint for which the Lagrange Multiplier will be zero.

Now forget about the "new rule" mentioned above. Try these instead, using Lagrange Multipliers:

h) Rework the problem, where each runner must run at least 5 miles.

i) Rework the problem, where no runner can run more than 10 miles.

j) Rework the problem, where no two runners can run more than 20 miles.

First: list all the constraints this rule imposes.

Second: eliminate all that involve Kevin. I'll tell you right now those are not binding. Then work the problem using the other constraints.

Third: the only reason I had you do that was to make the problem tractable, this should not be standard procedure.

S7. In problem S4, an individual was trying to minimize the cost of a 1600 square foot house. That cost, including tax (at $400 per foot of street frontage), is: $C = 200L + 600W$.

For aesthetic concerns, houses in the French Quarter (but not in the rest of the city) must have at least 30 ft. of street frontage, and can have a ratio of length to width that is no greater than 2. Calculate the length and width of the French Quarter house. How much more does a French Quarter house cost than a house elsewhere in the city?

Problem Set 5, ECO 4401. Utility theory and demand.

Relevant sections in your book are: 5.2-5.5 and 6.2-6.4.

We will go over most of the first part on Mon., Oct. 10. We will go over S7 on Wed., Oct. 12. You will turn in a couple of problems, identified below, on Fri., Oct. 14. If you miss class have someone else turn them in for you that day.

The problems will be graded in the following manner. You will either receive an "S" on the assignment, and receive 10/10 points, or you will receive a "U", in which case you may revise your homework per my comments and turn it in on Monday for 7/10. I reserve the right to make you revise your homework more than once, but I hope not to need to do that. Failure to complete revisions will result in 0/10.

You will have three homeworks before your next test; each will be worth 10 points, those points will be added to your actual test score (which will have a maximum of 70 points) to generate your second test grade.

<u>First</u> <u>Part</u>.

Your exercises are a mix of those from Ch. 5 and Ch. 6. The utility functions on which these are based are the same in both sets of exercises. In Chapter 5, these are those in #'s 1,2,3,4, and 6 (skipping number 5). In Chapter 6, these are #'s a) - e).

The problems using the utility function in Ch. 5 #6 (or Ch. 6 part e) cannot be solved using calculus. You must graph this one and use logic to work it out.

All problems below corresponding to the utility functions #4 and 6 (from Ch. 5) or, equivalently, c) and e) (from Ch. 6) will be turned in.

From Chapter 5, do exercises 7-10. You should do exercise 8 first, and that will simplify your work on subsequent problems.

From Chapter 6, do exercises ________. In number ______ also compute the total increase in utility that corresponds to a $1 increase in your budget, using the total differential. What's an easier way to do the same thing?

<u>Second</u> <u>Part</u>.

S7. Utility is more realistically generated by the consumption of goods which not only require money to buy, but time to enjoy. For example, the time cost of attending a baseball game is for most people greater than the monetary cost of the ticket; the time cost of listening to CD's is greater than the monetary cost of the CD itself. This problem will examine some of the implications of this fact.

First, let the agent maximize the utility function $U = xy$ where x and y are goods which require time to consume. The cost of x is $2 per unit, while the cost of y is $3 per unit, and the agent has $100 to spend.

a) Solve for the optimal amount of x and y consumed.

Now, each unit of x also requires 2 hours of time to enjoy, while each unit of y requires 1 hour of time to enjoy, and the agent has 60 hours of free time (outside of work) to spend. Free time not spent consuming x or y doesn't affect utility in any way.

b) Write out the inequality constraint this generates.

c) Solve for the optimal amount of x and y consumed. How has the time dimension altered the consumption of x and y? (A good answer to this question develops a little intuition, rather than just saying "more" or "less".)

d) Graph the feasible set, keeping in mind there are two constraints which must be satisfied here. Graph the optimum point and the indifference curve which travels through the optimum.

e) What is the interpretation of the Lagrange Multipliers here? These use that information to tell me whether the agent would prefer to work more or less hours at an hourly wage of $2.

f) Let t represent the number of hours of overtime that the agent wishes to work. (t can be negative or positive.) How would the constraints be altered if the worker could work as much overtime as she wanted to?

g) How many hours of overtime would the worker like to work? To answer this, solve the optimization problem (over x, y, **and t**) associated with the constraint in f). You may assume both constraints hold as equality constraints. How has this change altered the consumption of x and y? Does the worker work positive hours of overtime? Is that answer consistent with your answer to part e)?

Problem Set 6, ECO 4401, Darren Grant. You will turn in problem S8 on Fri., Oct. 28. You are welcome to ask me for assistance on it if you want to. We will go over the book exercises and S9 on Fri., Oct. 21 and Mon., Oct. 24.

Readings for this part are: 6.7, 8.2-8.6. Supplementary material is in 6.5 (elasticity) and 8.8 (consumer surplus). You won't be tested on the supplementary stuff on the upcoming test.

<u>First Part</u>.

From Chapter 6, do problems 8 and 10. From Chapter 8, do 1-6.

<u>Second Part</u>.

I have kept the algebra in this problem reasonable. Don't make it more difficult than it is.

S8. Perfume, jewelry, art, etc. belong (to a greater or lesser extent) to a class of goods called "prestige goods". People are presumed to enjoy paying high prices for these goods; it makes them feel important.

Let us represent the utility function for a prestige good X and a normal good Y as:

$$U(X,Y,p_xX)=XY+(p_xX)^2$$

where the budget constraint, as usual, is:

$$p_xX+p_yY=I$$

The idea behind prestige goods is that the price of the prestige good enters the utility function directly, and that $U_3 > 0$ (that is, the partial of U with respect to its third argument is positive).

a) What is the third argument of the utility function? Show that U_3 is in fact greater than zero.

b) Derive the Marginal Rate of Substitution as a function of p_x, X, and Y, and show that it is diminishing.

c) Derive the demand for X as a function of prices and income.

Let $p_y = 1$ and $I = 10$.

d) Graph the demand curve over the range of x prices $p_x \in (0,1)$. For what price range is demand downward sloping?

e) Then derive the compensated demand function, as a function of the utility level and px. Does the compensated demand curve always slope down?

Do you hate me yet? If not, try this next part!

f) Let the utility level for the compensated demand function in part e) be 100. Then, first, find the value of (x,p_x) where the two demand curves cross. Second, graph your compensated demand curve. Superimpose (put on top) this graph on your graph of the regular demand curve, and make clear which curve is above the other over different ranges of p_x.

S9. (Benson, extended.) A consumer purchases 10 units of X. Then, the price declines by \$5, and her income falls by \$50.

a) Will she now consume more than 10 units of X, exactly 10 units of X, or less than 10 units of X? Answer and illustrate with an indifference curve analysis.

A different take on the same problem. Let $U = XY$, $I = 1000$, and $p_x = p_y = 50$.

b) Verify that 10 units of X are purchased by solving the maximization problem.

For these last two, you also have to figure out what technique will give you the answer, as well as executing it to obtain the answer.

c) How much of an income reduction, accompanying a \$5 price decrease, would the consumer be willing to accept?

d) How much of good X would she purchase in the situation in part c)?

Problem Set 7. That part which must be turned in is due, along with all corrections on previous assignments, on Fri. Nov 4. We will go over the first part and maybe S10 on Monday, Oct. 31. On Fri., Nov. 4 we will go over your test and any questions from the second part that we have time for. Enjoy!

Your reading for this part is all of Chapter 7.

First Part.

Do the problems 1-5 in the back of Chapter 7. Number 5 will be turned in; we will go over the rest in class.

Second Part. Put on your thinking caps!

S10. Derive the Slutsky equation, decomposing income and substitution effects, for the change in the quantity demanded of some good with a change in the price of ANOTHER good. Then convert it into an elasticity formula.

S11. In your traditional consumer surplus analysis, the effect of a price floor is to reduce consumer surplus in the following way, as in graph 1.

The effect of a price ceiling is as shown in graph 2. Now we recognize that the proper measure of consumer surplus is read off the compensated demand curve, rather than the traditional demand curve. Given that caveat, graph 1 accurately measures the change in consumer surplus. Graph 2 overstates it, however; that is, the increase in consumer surplus in response to a price ceiling is less than the graph indicates. Why?

We will begin our first lecture on production, on Nov. 7, with this problem. You have seen it before! There are definite answers to both questions.

S12. My grandparents were profit maximizing farmers. They grew wheat from seed, insecticide, and fertilizer. Let's imagine that, after grandpa has already ordered his seed, insecticide, and fertilizer for the year, I walk up to him and give him $5, to be spent on seed, insecticide, or fertilizer (just one of the three), keeping the amount of the other two the same.

a) Which commodity should he buy?

b) What is the value of the extra wheat produced?

Problem Set 8, ECO 4401.

We will go over the first part on Wednesday, Nov. 16, and Fri. Nov 18. We will also go over some parts of S13 on Fri., Nov. 18.

Problem S13 will be due on Friday, November 18. It is a difficult problem (note the unlucky number, 13) and should be started immediately. No longer will you be asked to turn in corrected homework; you will get a grade on the first version, and woe is you if it is poorly done. This problem is worth ten points out of your final exam.

Readings:

Chapter 10, Sec. 10-2, 10.4-10.6
Chapter 11, Sec. 11.2, 11.3, 11.5, 11.8, 11.11
Chapter 12, Sec. 12.2, 12.4, 12.5

First Part.

Chapter 10: 1-6, on production functions a, b, d, e only.

Chapter 11: 1, 3-9, for production functions a, b, d, e

Chapter 12: 1-3, 5.

Second Part.

S13. The quantity demanded of a variable input of production (such as seed, insecticide, or fertilizer) will change in response to changes in the price of that input. This change can be broken down into a substitution effect and a scale effect, which are analogous to the substitution and income effects in consumer theory.

The scale effect is generated by the fact that firms will choose to increase or decrease their quantity produced in response to the changes in input prices. It differs from the income effect in that firms do not have a fixed income to spend; rather, they choose how much to produce (and how much to spend on inputs) based on profit maximization. Therefore, while the decomposition of quantity changes into substitution and scale effects is similar to the Slutsky equation in consumer theory, it is not identical to that equation.

Assume initially that the production function is Q(X,Y), where both X and Y are variable inputs.

a) Derive the equation which breaks down changes in quantity demanded into substitution and scale effects. To do this, first recognize that input demand curves derived from cost minimization are analogous to the compensated demand functions of consumer theory. Then write an identity relating these demand curves to input demand curves generated from profit maximization (the "actual" input demand curves). The proceed as in the derivation of the Slutsky equation.

b) Convert your formula into an elasticity relationship.

c) Graph the decompositions using isoquant analysis, and relate the mathematical terms to points and/or lines on the graph. Be clear--you must convince the reader what you are claiming is true.

Now let Q = ln(XY), let the market price of output be p, and the wage rates of X and Y be w_X and w_Y.

d) Let the price of output be 10 and the wage rate of X and Y be 2 and 1, respectively. The wage of X increases to 3. Decompose the change in the quantity of X demanded into scale and substitution effects. Do this in the following manner: First, write out each term of the decomposition in terms of w_X, w_Y, p, and/or Q. Then, fill in the appropriate numbers for each of these. Finally, use the total differential, realizing that $dw_X = 1$. This will both calculate substitition and scale effects and will verify that the equation holds in this instance, giving you a check on your work.

e) Draw another isoquant graph demonstrating the substitution and income effects in this instance. This graph will have numbers on the each axis, as opposed to the previous graph.

If you have difficulties, remember I am glad to help you in office hours.

Problem Set 9. This is it, folks. Last one. Here we have three parts. The first part is an adaptation of the problems in your book. The second part is composed of some of the tougher questions I use in my principles class. The third part is for you to turn in. Here we go!

The second part, and Chapter 13 stuff will be discussed on Fri., Dec. 2 and Mon., Dec. 5. The Chapter 14 stuff will be gone over on Dec. 9. Problem S14 will be due the last day of class, December 9. Get started early. What you hand in will be graded, no rewrites. It is worth 15 points of your final exam.

Readings for this set of material are: Sections 9.2, 13.2, 13.3, 13.5-13.7, 14.2-14.5.

First Part.

Chapter 13: 1-13
Chapter 14: 5,6

Second Part.

G6. You may want to draw a graph to answer this question. My friend runs a competitive firm that makes thumbtacks. Currently, the demand for thumbtacks is high, much higher than usual. She says, "I continue to produce thumbtacks until P = ATC. That way, you've sold all the thumbtacks you can make a profit on."

a) Is her total profit positive, zero, or negative?

b) Should she make more thumbtacks, less, or stay the same? Illustrate using a graph.

G7. Draw and use a graph for this question. My friend runs a typical firm in the thumbtack industry, which is a perfectly competitive industry. Demand is currently very high for thumbtacks, much higher than usual. She says, "I always produce that quantity for which average costs are lowest. That way, the markup (profit per unit) is largest, so I make the most money."

a) Is her markup largest at this quantity, or do you know? Answer either Yes, No, or You Don't Know.

b) Is her total profit largest at this quantity? Answer Yes, No, or You Don't Know.

c) Should she expand or contract output, or do you know? Answer either Yes, No, or You Don't Know.

R9. My friend says, "It is a commonly known fact that the cost of the food is only about 1/3 of the price of a restaurant meal. Therefore, all restaurant owners are making a huge profit."

a) Enrich my friend's mind. Discuss the other significant economic costs besides the food cost that the owner of a small restaurant faces.

b) Let us assume that we don't have any good data as to the actual cost structure of all the restaurants in town. What is the best simple piece of evidence that all restaurant owners aren't making a huge profit?

c) Often, the response I get to part b) of this question is as follows: "Restaurants are a perfectly competitive industry, so they make zero economic profit." This is theory, not evidence, so it doesn't answer the question. However, even as theory, there are two things wrong with the above statement. What are they?

G11. I have drawn two graphs below. The one on the left contains the demand and short-run supply curves for the orange juice industry, assumed for this problem to be a perfectly competitive industry. The other contains the marginal cost curve for a typical firm in the orange juice industry. Currently, firms have no incentive to enter or leave the orange juice industry. (The price axes on the two graphs are on the same scale. The quantity axes need not be on the same scale, but that won't affect the problem.)

I am now going to ask you to draw some curves. I have not given you numbers, so you do not know the precise shape of the curves. The curves you draw should be as accurate as possible, and should be such that the two graphs are logically consistent with each other.

1. Draw in the average total cost curve for the firm.

2. Rush Limbaugh begins advertising Florida Orange Juice on his radio show. Shortly afterwards we notice that the orange juice firm is producing at point Q^*. What has happened to the demand for orange juice? Draw in the new curve.

3. Is the orange juice industry an increasing cost industry, a decreasing cost industry, a constant cost industry, or do you know?

4. Notice that the market supply curve is a linear ray extending out from the origin. Because of this, the supply elasticity is identical at every point on the curve. a) What is it? b) Is it positive or negative? (One way to answer this question is pick two hypothetical points on the supply curve and compute the elasticity between them.)

5. A new discovery is made that allows orange juice firms to have lower fixed costs. How will this affect firm size (amount of OJ the firm makes) in the long run?

Third Part. Be sure to answer all parts of each question.

S14. Non-profit firms are not subject to Federal and State Taxes, by federal and state statute. In order for an organization to be a non-profit firm, there cannot be a residual claimant who is entitled to any profits the firm might earn. Nevertheless, non-profit firms can go out of business if they fail to pay their expenses. Therefore economists sometimes model non-profit firms as if they maximize revenue, subject to a zero-profit constraint. This is consistent either with 1) a self-interested bureaucrat who runs the firm and wishes to maximize his/her own power and importance (proxied by revenue), or 2) an organization which attempts to serve society as much as possible (here revenue proxies for serving society). I have worked in a variety of non-profit charitable organizations and have experienced examples of each type.

My mother worked for a while at the Hacienda Girls' Ranch in Melbourne; this non-profit firm took in wards of the state and was paid a sum per person by HRS from doing so. This could be modeled as if the Girls' Ranch was a non-profit firm which produces output Q from two variable inputs, X and Y, and "sells" this output on a competitive market at price p.

a) Draw prototype marginal cost and average total cost curves on a standard cost curve graph. Then identify and compare the short-run supply curves of a for-profit and a non-profit firm on the graph. At what price do they cross?

b) Let $Q = (XY)^{1/3}$ and the prices of X and Y be w_X and w_Y. Derive the (non-profit) firm's supply curve and the firm's factor demand curves. Is supply more or less elastic in non-profit firms?

c) Does the firm practice cost minimization? Demonstrate mathematically. Your work in b) will be useful here.

d) Show that the supply function derived in b) is increasing in price and decreasing in the factor prices. Do this mathematically, using derivatives.

e) Another desirable property of a supply (or demand) curve is that it be **homogenous of degree zero**. This means that if you increase all nominal quantities (the price of output and the factor prices) in the same proportion, the quantities supplied (or demanded) remain unchanged. If supply and demand curves were not homogenous of degree zero, then measuring value in terms of pennies rather than dollars, for instance, would change the quantities demanded and supplied on the market. This would be non-sensical. Determine whether the supply curve generated in part b) is homogenous of degree zero, supplying mathematical proof or disproof as necessary.

f) Let the factor prices be 1 each. Also, let there be 10 firms in the industry, and let the market demand curve be $D(p) = 60 - p$. Solve for the equilibrium price and quantity. How much does each firm produce? Now let $w_X = 2$. Solve for the new equilibrium price and quantity. Graph the original supply and demand curves and the original equilibrium point. Then, on the same graph, show how the supply and/or demand curves shift in response to the change in the factor price, and identify the new equilibrium point.

g) Compare the efficiency properties of a market supplied by non-profit firms vs. one supplied by for-profit firms, in the short and long run. You do not need to solve this mathematically, only with a graph. Do this by drawing a graph with market demand, for-profit supply, and non-profit supply. Then compare the efficiency of the equilibria which occur under for-profit and non-profit supply. Identify any deadweight loss. The short run differs from the long run in the prices that may be charged. Finally, discuss the effect of a tax on allocative efficiency in the short run, in both the for-profit and non-profit markets.