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4:10pm ET

Version B

EXAM III

Instructions:

The exam is open book. Feel free to check your notes, the lecture handouts, the textbook. You can also search for concepts and ideas online.

Please, write your FULL NAME and UNI on each page of your answers before you submit them.

The exam starts at 8:00am Eastern Time (NYC;   GMT – 4)

The exam is composed of four (4) questions for a total of 50 points.
Answer all four questions.

Upload your answers to Gradescope, unless other arrangements were made due to your location.
The general class must upload answers by: 9:20am Eastern Time (NYC;   GMT – 4)

Students registered with ODS can adjust their time according to their accommodation letters, as agreed.

As Columbians we all sustain a learning community built around Honor, hence you solemnly swear that you will not give or receive illegitimate help on this examination and that the work that you submit is yours and yours alone.

Good Work!!

Answer the following four questions.

Question 1 (15 points)
Research by Maria Prados and Stefania Albanesi shows that after 1995 the US economy experienced a decline in the labor force participation of married women. The decline was particularly marked for women with at least a college degree.
Consider Olivia a college graduate who enjoys consumption goods (C) and leisure time (L). Upon graduating college, she is offered a job that pays $50 an hour. Her yearly time budget is 6,000 hours. The unit price of consumption goods is $1.
a) Write the expressions for Olivia's time constraint and income constraint and then combine them to find her yearly budget constraint.
b) In a diagram measuring leisure time along the horizontal axis and consumption along the vertical axis draw Olivia's budget constraint. Olivia's utility from consumption and leisure time is $U(C,L) = C^{1/3}L^{2/3}$.
c) Write Olivia's Utility Maximization Problem.
d) Compute first order conditions and solve for Olivia's optimal level of consumption and optimal number of hours of leisure.
e) What is the economic interpretation of the condition: $|MRS_{C,L}| = MU_L/MU_C = w/p$ where w is the hourly wage rate and p a measure of the general level of consumer goods prices?
f) In your diagram, add an indifference curve to illustrate Olivia's optimal bundle.
g) How many hours does Olivia work this year?
Olivia gets married to another college graduate who earns $200 an hour. After marrying, Olivia shares expenses with her spouse. Effectively it is as if she receives $200,000 of income from other sources each year.
h) Write the expression of Olivia's yearly budget constraint after she gets married and illustrate her new budget constraint in your diagram.
i) Show that after marrying, each year Olivia wishes to enjoy more than 6,000 hours of leisure time and so she decides to drop out from the labor force.
j) In your diagram, illustrate Olivia's optimal bundle after marrying.

Question 2 (15 points)
SmartBio is the sole producer of *Brilliant*, a vitamin juice that improves brain function for people under stress. The firm's Total Cost is $TC = 20Q + 100$. Currently, SmartBio is selling its product only in the country of *Allrules* where demand is $Q^D_A = 1,000 - 10P$. In *Allrules*, firms cannot price discriminate and must charge the same unit price on each unit they sell.
a) How many units of *Brilliant* is SmartBio selling? At what price?
b) In a diagram, illustrate SmartBio demand, marginal revenue, profit maximizing quantity and profit maximizing price.
c) Is the quantity of *Brilliant* that SmartBio sells in *Allrules* socially optimal? Why? If not, how could you evaluate the loss in potential social welfare in this market?
SmartBio receives approval to sell *Brilliant* in the country of *Everythinggoes* where firms can use various pricing schemes to enhance their profit. In *Everythinggoes,* there are 100 potential customers each with demand $q_D = 10 - 0.1P$ and BioSmart decided to sell its product through an online app that charges a sign-up fee (F) and then sells Brilliant at a unit price P (this is an example of a two-part tariff).
d) What unit price P and sign-up fee F would maximize BioSmart's profit from sales in *Everythinggoes*?
e) Would consumers from *Everythinggoes* rather buy the vitamin juice in *Allrules*? Explain.

Question 3 (10 points)
There are two undeveloped lots remaining in a small city. The lot owners are considering whether to develop each lot for commercial or residential use (city zoning would permit either use). One lot is located on the north side of town, while the other lot is located on the south side. The lot owners' profits net of any additional costs are given in the matrix below; both owners have all of this information.

North Side Lot

		Commercial	Residential
South Side Lot	Commercial	East: $4M profit / West: $3M profit	East: $9M profit / West: $9M profit
	Residential	East: $7M profit / West: $7M profit	East: $5M profit / West: $10M profit

a. In game theory, what is a 'best response' function? Apply the concept to this game and find the North Side lot owner's best response function.
b. In game theory, what is a 'dominant strategy'? In this game, does either lot owner have a dominant strategy? Explain.
c. If the lot owners will make their decisions simultaneously (meaning, neither owner will know the other's choice in advance), what outcome do you expect and why? Use numbers from the table to explain.

Question 4 (10 points)

Consider duopoly where demand is $Q_D = 70 - P$ and two firms, firm A and firm B, compete against each other a la Cournot by simultaneously choosing quantity. The two firms have identical total cost $TC(q) = 10q$. Keep in mind that $Q = q_A + q_B$.

a) Find firm A's best response function to the quantity q_B chosen by firm B and draw it in a diagram where you measure the quantity produced by firm A along the horizontal axis and the quantity produced by firm B along the vertical axis.

b) Find the Cournot equilibrium and illustrate it in your diagram. Keep in mind that your diagram must have a best response curve for firm A and a best response curve for firm B.

Suppose firm A discovers a new process that lowers its total cost to $TC'_A(q_A) = 4q_A$. Total cost at firm B stays the same.

c) At the new Cournot equilibrium, will firm A produce more or less than before? Will firm B produce more or less than before? Will total output be higher or lower than before? Clearly explain.

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