Midterm 1 - Solutions

University of California, Berkeley
February 28^{th}

1 Consumer Choice - 40 points

Joe's utility from consumption (C) and hours of leisure in a day (L) is given by:

$$u(C, L) = 800 \ln(L) + C$$

The price of one unit of consumption is \$1.
Joe works in a factory where he faces two options: Earn a wage of \$40/hour without joining the union, or join the union and earn the union salary of \$50/hour. Union membership fees are \$50 per day.
(Note: $\frac{d\ln(x)}{dx} = \frac{1}{x}$.)

a. (8 points) Graph the two budget constraints from joining the union and not joining the union on a single set of axes. Place hours of leisure on the horizontal axis. Make sure to include slopes and intersection points of axes.

b. (14 points) How many hours a day will Joe work if he doesn't join the union? How many hours a day will he work if he joins the union?

c. (10 points) Is it worthwhile for Joe to join the union? You *must* justify your answer and clearly show why you answered the way you did.

d. (8 points) What are the maximum member fees that Joe is willing to pay the union?

2 Uncertainty - 20 Points

Mark owns a media company. His utility function is given by

$$U = \sqrt{M},$$

where M is the company's annual profit. Mark is considering whether his company should invest in making a movie. If the movie is a huge success, the annual profit will be \$2.5 billion. If the movie is less successful the profit will be \$36 million. The probability of success is 0.25 and the probability of failure is 0.75.

a. (6 points) Find both expected profits and expected utility from making the movie.

b. (8 points) FOX comes along and offers to buy the rights to make the movie. If he sells, FOX will earn whatever profits the movie yields. What is the minimum amount of payment that Mark would accept to sell the right to make the movie?

c. (6 points) Assume FOX offered the minimum amount required for Mark to sell the rights as identified in the previous problem. However, before they start the transaction, Roger Ebert (a movie critic) approaches Mark and tells him that he can predict whether the profits will be \$2.5 billion or \$36 million with certainty. Roger Ebert is willing to sign a confidentiality agreement so that FOX will

3 Production - 40 points

Jane's Tuna-tastic! Cat Food Company produces tuna flavored cat food using human workers (labor) and robot workers (capital). Production is characterized by the following function: $q = L^{1/3}K^{2/3}$, where q is tons of Tuna-tastic! Cat Food produced per hour, L is labor hours and K, is number of robots. If Jane hires workers, she must pay each worker 5 dollars per hour and if she uses robots, she must rent each robot from Robot Supply Inc. for 20 dollars per hour.

a. (6 points) Find the MRTS, and the optimal K/L ratio.

b. (6 points) If Jane initially wants to produce 10 tons per hour, how much capital and labor are used if she is minimizing costs?

c. (6 points) In the short run with the amount of capital fixed from the previous problem, find the cost function in terms of q if there are initial fixed costs of \$30 in addition to any fixed capital costs.

d. (10 points) Now, assume Jane has the opportunity of using a new production process given by $q = L^{1/2}K^{1/2}$ for a fixed cost of \$50 in addition to any fixed capital costs. If the amount of capital is still fixed from part (b), and she still wants to produce 10 tons of Tuna-tastic! per hour should she switch? Must explain.

e. (12 points) What if she were thinking of expanding production and wanted to produce 40 tons of Tuna-tastic! per hour in the long run, should she switch? Must explain.