Name Key

ISyE 4301A Quiz 1

1. Suppose a firm has a budget of \$10,000 and is choosing from inputs Y_1, Y_2, and Y_3. The per unit input cost for each is \$10, \$15, and \$8 respectively. Their choice gives an output of $q=100Y_1^{0.3}Y_2^{0.5}Y_3^{0.2}$. Write out the formulation (but do not solve) for the firm's optimization problem and explain in words what the solution to this problem gives.

$$\max \quad 100\, Y_1^{.3}\, Y_2^{.5}\, Y_3^{.2}$$

$$\text{s.t.} \quad 10Y_1 + 15Y_2 + 8Y_3 = 10000$$

$$Y_i \geq 0 \quad \forall i$$

Turn into an unconstrained optimization problem by using Lagrange multiplier. Solve for first order conditions (i.e., $\frac{\partial \mathcal{L}}{\partial y_i} = 0$, $\frac{\partial \mathcal{L}}{\partial \lambda} = 0$)

2. Explain in words what price elasticity of demand means. You can use a formula to help explain if you would like.

It is the percent change in demand over the percent change in price (i.e., a measure of how demand changes with price).

Note: when you have completed you quiz, please turn the page over. There is a Sudoku puzzle if you get bored.

Name_____

ISyE 4301A Quiz 2

1. Suppose the demand function for a monopolist is: $P = 100 - \sqrt{Q}$. In addition, the marginal cost per item is \$10. Write out the profit function and explain (but don't solve) how you would determine the optimal price to charge.

$\Pi = (P - c)Q = (90 - \sqrt{Q})Q$

solve $\frac{\partial \Pi}{\partial Q} \equiv 0$ to get Q^*. Then

determine $p^* = 100 - \sqrt{Q^*}$

2. The EARL decides to offer discounts for concerts to students. Students have a demand function given by Q=100-3P. The demand function for non-students is given by Q=100-P. Fire code restrictions limit the number of people attending a concert to 50. Write the formulation (and explain how to use, but DO NOT SOLVE) to determine the prices to offer students and non-students.

let $Q_1 = 100 - 3P_1$ $\quad Q_2 = 100 - P_2$

$$\max \quad P_1(100 - 3P_1) + P_2(100 - P_2) - c[(100 - 3P_1) + (100 - P_2)]$$

s.t.

$$(100 - 3P_1) + (100 - P_2) \leq 50$$

$$100 - 3P_1 \geq 0$$

$$100 - P_2 \geq 0$$

$$P_1, P_2 \geq 0$$

(Note: would also set up in terms of Q_i values)

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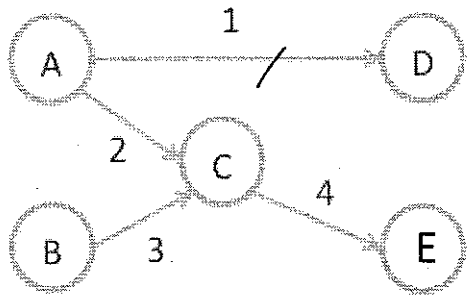
ISyE 4301A Quiz 3

1. For the network shown below (the legs are numbered on the arcs; each leg has a capacity of 130), write out the capacity constraints for the primal bid pricing LP. Please define your variables clearly.



Ticket	Origin/Destination	Class	Price
1	A-D	Y	140
2	A-D	Z	80
3	A-C	Y	140
4	A-C	Z	115
5	A-E	Y	320
6	A-E	Q	280
7	A-E	Z	210
8	B-C	Y	250
9	B-C	Z	210
10	B-E	Y	350
11	B-E	Z	300

$x_1 + x_2 \le 130$

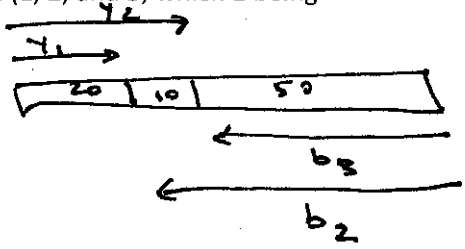
$x_3 + x_4 + x_5 + x_6 + x_7 \le 130$

$x_8 + x_9 + x_{10} + x_{11} \le 130$

$x_5 + x_6 + x_7 + x_{10} + x_{11} \le 130$

2. A flight has a capacity of 80 seats in coach class (all seats are equivalent). The expected marginal seat revenue heuristic came up with protection levels for the three ticket types (1, 2, and 3, which 1 being highest) of y1=20 and y2=30. Which of the following is true?

- ✗ a. At most 20 tickets can be sold of ticket type 1
- ✗ b. At least 30 tickets are held to be sold for ticket type 2
- ✓ c. At most 50 tickets can be sold for ticket type 3
- d. a. and c. are both true
- e. b. and c. are both true
- f. a., b., and c. are all true
- g. None of the above



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