

INTERNATIONAL UNIVERSITY OF JAPAN
Public Management and Policy Analysis Program
Graduate School of International Relations

DCC5350 (2 Credits)
Public Policy Modeling
Spring 2017

Homework 1: Basic Math (100 points)

Instruction: First, read the handout available on the course Web page. PLEASE handwrite in A4 papers; DO NOT use a wordprocessor. Write down your student ID and name on the top of your answer. Organize your answer in the ascending order (1, 2, ...) and use single column. Show all necessary steps to get the answer; DO NOT simply write down an answer. You MAY NOT communicate with others except for the TAs and instructor to do this homework. Submit your answer to TAs at the start of the class on April 12.

■ **Question 1 (5 points):** simplify following expression. Follow ALL necessary steps.

Q 1.1 (5 points) $-\frac{5}{2} \div \frac{-1}{3} + 4 =$

■ **Question 2 (10 points):** The Cobb-Douglas production function and its log transformation are given below. Assume that all of these terms are not zero.

$$Y = AL^\beta K^\alpha$$

$$\log Y = \log A + \beta \log L + \alpha \log K$$

where Y is the total production, A is the total factor productivity, L is the labor input, K is the capital input, α is the output elasticity of the capital, and β is the output elasticity of the labor.

Q 2.1 (5 points) Rearrange the Cobb-Douglas function (1st formula) with respect to A.

Q 2.2 (5 points) Rearrange the log transformation (2nd formula) with respect to α .

■ **Question 3 (15 points):** Solve following equations for x and/or y. Show ALL necessary steps.

Q 3.1 (5 points) $\frac{y}{3} + 1 = 2y - 2$

Q 3.2 (10 points)
$$\begin{cases} 4x - 2y = 10 \\ \frac{y}{2} + 1 = 3 - \frac{x}{2} \end{cases}$$

■ **Question 4 (10 points):** Indicate the relevant region of $-2y + 10 \leq -4x$. Show how you draw the linear equation line and how you select a region.

■ **Question 5 (40 points):** Answer the following questions using matrices A and B below. Show all necessary steps for Q5.1 through Q5.4; otherwise, you may not get full credits.

► Use $A = \begin{bmatrix} .80 & .15 & .05 \\ .10 & .70 & .20 \\ .05 & .35 & .60 \end{bmatrix}$ and $B = \begin{bmatrix} .80 & .15 & .05 \\ .30 & .55 & .15 \\ .05 & .35 & .60 \end{bmatrix}$

Q 5.1 (2 points) Get A' (transpose) manually.

Q 5.2 (3 points) Get $A+B$ manually.

Q 5.3 (5 points) Get $A-B$ manually.

Q 5.4 (10 points) Get AB manually.

Q 5.5 (5 points) Get $|A|$ and $|B|$ using Excel.

Q 5.6 (5 points) Get AB and BA using Excel.

Q 5.7 (5 points) Get A^{-1} and B^{-1} using Excel.

Q 5.8 (5 points) Get $(BA - AB)^{-1}$ using Excel.

*Create an Excel worksheet for Q5.5-Q5.8 with your ID and name printed on the 1st row. Attach a hardcopy of the worksheet for Q5.5-Q5.8 (Do not solve Q 5.5-Q5.8 manually).

■ **Question 6 (20 points):** The following cross-tab is a summary of the question “Considering everything, how satisfied are you with your job?” in 2015 U.S. Federal Employee Viewpoint Survey (Unit=the number of respondents). Use four digits below the decimal point for probabilities in order to avoid the rounding error.

Age group	Satisfied	Dissatisfied	Indifferent
25 and under	1,566	496	548
26-29	6,636	3,017	2,413
30-39	36,406	19,274	15,705

Q 6.1 (5 points) Calculate the probability that a randomly chosen respondent is satisfied, $P(\text{satisfied})$, and is at his or her age of 30-39, $P(30-39)$.

Q 6.2 (5 points) Calculate the following conditional probabilities: $P(25 \text{ and under} | \text{satisfied})$ and $P(26-29 | \text{satisfied})$

Q 6.3 (5 points) What is the probability that a randomly chosen respondent at his or her age of 30's is satisfied with the job? That is, $P(\text{satisfied} | 30-39)$

Q 6.4 (5 points) Based on the results of Q6.1 through Q6.3, would you conclude that age group is statistically independent of job satisfaction? Show me your reasoning.

■ Checklist: You answer sheet (A4 format) and a hardcopy of your Excel worksheet.

End of homework 1.