

FINAL EXAM
ODD SEMESTER 2018/2019 ACADEMIC YEAR
MATHEMATICS FOR ECONOMICS AND BUSINESS (ECEU601100)
THURSDAY, 20 December 2018

Rules:

- Closed Book & Notes.
- Calculator is allowed.
- Handphone/Tablet are not allowed.
- Exam time: 3 hours.
- Answer all the problems below.

Problem I

Dewi is an art collector. One of her piece of collection is a painting which is currently worth USD 100. If the value of the painting is appreciating over time following the equation $V = f(t) = 100e^{\sqrt{t}}$. Answer the following questions;

- a. Write the present value formula of the painting as a function of t ! **[Point 4]**
- b. Transform the present value function, from 1.a, into natural logarithm function! **[Point 4]**
- c. How long should the art collection be kept to maximize its present value if interest is compounded continuously, at $r=0.08$? **[Point 10] T1**
- d. Using the Second Order Test (SOC), show that the solution obtained in 1c is maximum! **[Point 7]**

Problem II

Gasing is a toy manufacturer which produces two types of toy, finger puppet (x) and a hand puppet (y). Gasing's profit function is as follow

$$\pi = -2x^2 + 60x - 3y^2 + 72y + 100$$

According to the information given above:

- a. How many finger puppets and hand puppets, each, should the manufacturer produce to maximize its profit? **[Point 10] T1**
- b. Proof that the answer obtained in part a does maximize Gasing's profit! **[Point 10]**
- c. How much maximum profit could Gasing acquire? **[Point 5]**

Problem III

Suppose Mr. Purnama's utility is determined by the leisure time which he spent for two activities; fishing and coaching futsal for children age 5-10 years. His utility function is

$$U(x, y) = 18\ln(3x) + 6\ln(2y)$$

Where x is the time for fishing (in hours) and y is the time for coaching futsal for children age 5-10 years (in hours). Mr. Purnama has a limited time for leisure, he only has 12 hours in a week that is allocated for the two activities according to the following function: $x + y = 12$.

a. **(Point: 3)** Write each of the following formulas;

- objective function
- constraint function
- Lagrangian function.

to solve Mr Purnama's utility maximization problem

b. **(Point: 14) T1** Compute the

- Lagrangian multiplier;
- Mr. Purnama's time allocation for fishing and for coaching futsal for children age 5-10 years
- Mr Purnama's maximum utility

c. Interpret the Lagrangian multiplier. **(Point: 2) T2**

d. Check the second-order sufficient condition (SOSC) for a maximum. **(Point: 6)**

Problem IV

4A. Suppose the marginal revenue function of a commodity is $MR = 60 - 2Q - 2Q^2$. Based on the given information, define the commodity's total revenue function! **[Point 12]**

Hint: when $Q=0$, $TR(Q)=0$

4B. Suppose the change of price (P) as an effect of a change in output (Q) is defined as follow:

$$\frac{dp}{dq} = 3q^2 + \frac{1}{2}\sqrt{q}$$

Write the primitive function of price, as a function of output! In addition to constructing the primitive function, notice that when when output is zero, price is equal to 10. **[Point 13]**