CODE: No.1 - FE1718

FACULTY OF INFORMATION TECHNOLOGY
DEPARTMENT OF MATHEMATICS

SOCIAL REPUBLIC OF VIETNAM
Independence - Freedom - Happiness

FINAL EXAM
Times: 75 minutes
THE01002. CALCULUS 2

Description of the test : this test includes 4 exercises. Points are distributed as follows:

Question	1	2	3	4
Points	1.5	3.5	1.5	3.5

Exercise 1. [1.5 pts] Solve the differential equation:

$$\frac{dy}{dx} = \frac{y}{x+1}, \text{ where } y_0 = 1 \text{ when } x_0 = 1.$$

Exercise 2. [3.5 pts] Suppose that the size $N(t)$ of a population at time t according to the equation

$$\frac{dN}{dt} = \frac{1}{200}N^2, \text{ with } N(0) = 20.$$

a) [1.5 pts] Solve the equation and find the size of the population at time $t = 5$.

b) [1.0 pt] Graph $N(t)$ as a function of t for $0 \leq t \leq 10$. What happens as $t \to 10$? Explain in words what this means.

c) [1.0 pt] Find the average size of the population between $t = 0$ and $t = 5$.

Exercise 3. [1.5 pts] Let $N(t)$ denote the size of a population at time t. Assume that the population evolves according to the logistic equation. Suppose that then intrinsic growth rate is 4 and the carrying capacity is 50.

a) [1.0 pt] Find a differential equation that describes the growth of this population.

b) [0.5 pt] Without solving the differential equation in a), sketch solution curve of $N(t)$ when $N(0) = 15$.

Exercise 4. [3.5 pts] Suppose that a fish population evolves according to the logistic equation and that a fixed number of fish per unit time are removed. That is,

$$\frac{dN}{dt} = rN(1 - \frac{N}{K}) - H.$$

Assume that $r = 2$, $K = 100$, and $H = 48$

a) [1.5 pt] Find the equilibria of the equation.

b) [2.0 pts] Analyze their stability, using both: the graphical approach, and the analytical approach.

LECTURER
Quang Sang PHAN

REVIEWED BY

CODE: No.2 - FE1718

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DEPARTMENT OF MATHEMATICS

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FINAL EXAM

Times: 75 minutes

THE01002. CALCULUS 2

Description of the test : this test includes 4 exercises. Points are distributed as follows:

Question	1	2	3	4
Points	1.5	3.5	1.5	3.5

Exercise 1. [1.5 pts] Solve the differential equation:

$$\frac{dy}{dx} = \frac{y+1}{x}, \text{ where } y_0 = 2 \text{ when } x_0 = 1.$$

Exercise 2. [3.5 pts] Suppose that the size $N(t)$ of a population at time t according to the equation

$$\frac{dN}{dt} = \frac{1}{100}N^2, \text{ with } N(0) = 10.$$

a) [1.5 pts] Solve the equation and find the size of the population at time $t = 5$.

b) [1.0 pt] Graph $N(t)$ as a function of t for $0 \leq t \leq 10$. What happens as $t \to 10$? Explain in words what this means.

c) [1.0 pt] Find the average size of the population between $t = 0$ and $t = 5$.

Exercise 3. [1.5 pts] Let $N(t)$ denote the size of a population at time t. Assume that the population evolves according to the logistic equation. Suppose that then intrinsic growth rate is 3 and the carrying capacity is 40.

a) [1.0 pt] Find a differential equation that describes the growth of this population.

b) [0.5 pt] Without solving the differential equation in a), sketch solution curve of $N(t)$ when $N(0) = 10$.

Exercise 4. [3.5 pts] Suppose that a fish population evolves according to the logistic equation and that a fixed number of fish per unit time are removed. That is,

$$\frac{dN}{dt} = rN(1 - \frac{N}{K}) - H.$$

Assume that $r = 2$, $K = 200$, and $H = 96$

a) [1.5 pt] Find the equilibria of the equation.

b) [2.0 pts] Analyze their stability, using both: the graphical approach, and the analytical approach.

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Quang Sang PHAN

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