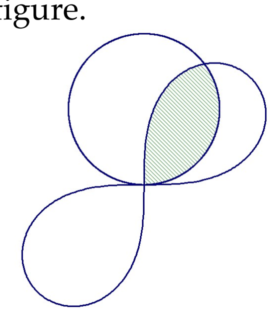
HCMC UNIVERSITY OF TECHNOLOGY AND EDUCATION
Faculty of Applied Science
Department of Mathematics

FINAL EXAMINATION SEMESTER 2
ACADEMIC YEAR 2022-2023
Course name: Calculus 2
Course code: MATH132501E
Number of pages: 02
Date of exam: 26/05/2023
Duration: 90 minutes.
Open-book.

Question 1 (2 pts). Let A be the region bounded by the curves $y = x^2 + 1$ and $y = 2x^2$.

a. Determine the area of region A.
b. Find the volume of the solid B whose base is the region A, and which has the property that each cross section perpendicular to the x-axis is a square.

Question 2 (1 pt). Find the area of the shaded region bounded by the circle $r = 2\sin(\theta)$ and $r^2 = 4\sin(2\theta)$ in the figure.



Question 3 (1 pts). Find the improper integral:

$$I = \int_2^{\infty} \frac{dx}{x(x^2+4)}.$$

Question 4 (1.5 pt). Solve the following first-order initial value problem:

$$y' - 2y = xe^x, \quad y(0) = 1.$$

Question 5 (1 pt). Express the repeating decimal $3.4\overline{25}$ as a rational number $\frac{p}{q}$.

Question 6 (1pt). Test the following series for convergence:

$$\sum_{k=1}^{\infty} \frac{5 - \cos(\pi k)}{3k^2 + \ln k}.$$

Question 7 (1.5 pts). Find the interval of convergence for the power series:

$$\sum_{k=1}^{\infty} \frac{2^k (x-3)^k}{k+3}.$$

Question 8 (1 pt). Let $A(1,2), B(3,1)$ and $C(1,m)$ be the points on the plane. Let H be the midpoint of the line segment AB. Find the value of m so that CH is perpendicular to AB, then find the area of the triangle ABC with that value.

Note: Proctors are not allowed to give any unauthorised explaination.

Expected Learning Outcomes		Questions
CLO1	Explain the concept of convergence of improper integrals and of series of numbers, and convergence set of power series.	3,5,6,7
CLO2	Use methods of integration. Test an improper integral or a series for convergence, and find the convergence set for a power series.	1,2,3,4,5,6,7
CLO3	Construct mathematical models using the first-order linear differential equations.	4
CLO4	Evaluate the dot product and the cross product of two vectors in $\mathbb{R}^3$.	8
CLO5	Establish formulas for area of a region in plane, volume and arclength by using definite integrals.	1,2

15/05/2023

Approved by program chair

(signed and named)

TS. Phạm Văn Hiển