

Name I.D. Section...

Mahidol University International College
Final Examination
ICMA106 Calculus I
First Trimester 2018–2019
8 December 2018, 10:00 - 11:50

Instructions. The exam consists of 9 main problems (**95 points=35%**) with points indicated in each problem. Show all your work clearly. A calculator is NOT allowed for this exam. Make sure to fill in your name, student I.D., and your section instructor's name in the space provided on the first page. If not otherwise specified, your answer to every problem must be in **simplest** form.

SCORE

Problem 1. (10 points)

(a) Find the differential du if $u = \frac{x^2}{\sqrt{\sec x}}$. (3 points)

(b) Find f where $f'(t) = 2 \csc^2 t - 3 \sin t$, $f(\pi/2) = 1$. (7 points)

SCORE

Problem 2. (10 points)

A pebble is thrown into a pond, and the ripples spread in a circular pattern. If the radius of the circle increases at a constant rate of 1 meter per second, how fast is the area of the circle increasing when the radius is 4 meters?

SCORE

Problem 3. (10 points)

Let $f(x) = -x^3 + 9x^2 - 15x - 25$. Sketch a graph of this polynomial and label the coordinates of the intercepts, relative extrema, and inflection points.

Hint: $-x^3 + 9x^2 - 15x - 25 = -(x + 1)(x - 5)^2$

SCORE

Problem 4. (10 points)

Find the absolute maximum and minimum values of $f(x) = \sqrt[3]{(x^2 + 1)^2}$ on the interval $[-1, 2]$.

SCORE

Problem 5. (10 points)

A box with an **open top** is formed from a square piece of cardboard that is 6 feet wide. Find the largest volume of the box that can be made from the cardboard.

SCORE

Problem 6. (10 points)

Find the point on the line $y = 4x + 6$ that is closest to the origin $(0, 0)$.

SCORE

Problem 7. (15 points)

Evaluate the integrals (a - e).

a)
$$\int \frac{\sqrt{s} - 4s^2}{s} ds$$

b)
$$\int x^2 \sqrt{x+1} dx$$

c)
$$\int_0^1 t(1+t^2)^2 dt$$

$$\text{d) } \int_0^1 \sin^2 \theta (1 + \cot^2 \theta) d\theta$$

$$\text{e) } \int \frac{\csc^2 \theta}{\sec \theta} d\theta$$

SCORE

Problem 8. (10 points)

Sketch the region enclosed by the following curves and find its area.

$$y = 14 - x^2, \quad y = x^2 - 4.$$

SCORE

Problem 9. (10 points)

Find the area of the region bounded by the graphs of $x = y$ and $4x + y^2 = -3$.

You may tear this page apart as a scratch paper.

You may tear this page apart as a scratch paper.