



FINAL
Examination Paper

(COVER PAGE)

Session : **January 2020**

Programme : **Foundation in Science (CFSI)**

Course : **MAT1210: Mathematics 1**

Date of Examination : **6 April 2020 (Monday)**

Time : **9:00am – 1:00pm**

Duration : **4 Hours** Reading Time : **Nil**

Special Instructions :

This paper consists of FOUR (4) questions. Answer ALL questions.

All questions carry equal marks.

IMPORTANT NOTE : THIS PAPER SHOULD NOT BE TAKEN OUT OF THE EXAMINATION HALL

Materials Permitted : **Non-Programmable Calculator**

Materials Provided : **Formula Booklet**

Examiner(s) : **Ms. Teng Mei Tuan**

Moderator : **Dr. Ch'ng Pei Eng**

This paper consists of 3 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)

MAT1210: MATHEMATICS 1

FINAL EXAMINATION: JANUARY 2020 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Question 1

(a) Solve the following equations:

(i) $2^{x^2} = \frac{1}{4^{-4}}$. (3 marks)

(ii) $(\lg x)^2 - \lg x^2 + 1 = 0$. (4 marks)

(b) Solve $\csc 3x = -2$ for $0^\circ < x < 360^\circ$. (5 marks)

(c) Find the exact value $\cot \frac{9\pi}{4}$ without using calculator. (3 marks)

(d) Use the factor theorem to prove that $2x - 1$ is a factor of $P(x) = 2x^3 + x^2 - 5x + 2$.
Hence, factorise $P(x)$ completely. (7 marks)

(e) Rationalize the denominator of $\frac{\sqrt{2} + 6}{6 - \sqrt{2}}$. (3 marks)

Question 2

(a) Solve the radical equation $\sqrt{x-2} - \sqrt{x-1} = 1$. (4 marks)

(b) Solve the equation $4\cos^2 x = 3$ for $0 < x < 2\pi$. (4 marks)

(c) Given $f(x) = e^{3x} \cos x$, find $f'(x)$ and $f''(x)$. (7 marks)

(d) Given that $f(x) = 1 - 2x, x \in \mathfrak{R}$ and $g(x) = x^2 - 1, x \in \mathfrak{R}, x \geq 0$. Find

(i) the function of $fg(x)$, (3 marks)

(ii) the inverse function of $g(x)$. (4 marks)

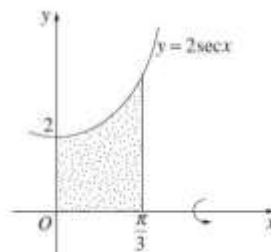
(e) Find $\frac{dy}{dx}$ for $y = 4\sin^3 x$. (3 marks)

Question 3

- (a) Find the coordinates of the turning points of $y = -x(x+4)^2$. Hence, determine the nature of the turning points. (8 marks)
- (b) Differentiate each of the following with respect to x :
- (i) $(4x+1)^3 \tan x$. (2 marks)
- (ii) $\frac{\cot x}{e^x}$. (3 marks)
- (c) Find $\frac{dy}{dx}$ for $x^2 + 2xy - y^2 = 1$ by using implicit differentiation. (5 marks)
- (d) Find the derivatives of $y = x^3 - \ln x^3$. (3 marks)
- (f) Evaluate $\int_0^2 (2x-3)^4 dx$. (4 marks)

Question 4

- (a) The following diagram shows a shaded region that is bounded by the curve $y = 2 \sec x$, the coordinate axes and the line $x = \frac{\pi}{3}$. The shaded region is rotated about the x -axis. Find the volume of the solid generated. (5 marks)



- (b) Evaluate each of the following:
- (i) $\int_2^5 \frac{x+2}{x^2+4x} dx$. (4 marks)
- (ii) $\int_0^{\pi/2} \sin^2 x \cos^3 x dx$. (6 marks)
- (c) Find the indefinite integrals of $\int 2x(x^2+10)^{13} dx$ by using integration by substitution. (5 marks)
- (d) Evaluate the definite integral of $\int_0^{\pi/4} x \sin 2x dx$ by using integration by parts. (5 marks)