



INTI
International College Penang

FINAL
Alternative Assessment

Session : August 2020

Programme : Foundation in Science (CFSI)

Course : **MAT1210: Mathematics 1**

Date of Examination : 14 December 2020 (Monday)

Time : 9:00am – 11:30am Reading Time : Nil

Duration : 2 hours + 30 minutes (uploading time)

Special Instructions :

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

All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Formula Booklet 1

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

Moderator : Dr. Ch'ng Pei Eng

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

FOUNDATION IN SCIENCE (CFSI)
MAT1210: MATHEMATICS 1
FINAL ALTERNATIVE ASSESSMENT: AUGUST 2020 SESSION

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

Question 1

(a) Solve equations:

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

(ii) $(\lg x)^2 - 1 = 0$. (3 marks)

(b) Solve $\sec \frac{x}{3} = -2$ for $0^\circ < x \leq 360^\circ$. (5 marks)

(c) Find the exact value of $\csc 600^\circ$ without using calculator. (3 marks)

(d) Rationalize the denominator of $\frac{\sqrt{3}+5}{5-\sqrt{3}}$. (4 marks)

(e) Find the definite integral $\int_0^{\frac{\pi}{2}} \sin^2 x \cos^3 x \, dx$. (6 marks)

Question 2

(a) Expand $(1-x)^{\frac{1}{2}}$ in ascending powers of x up to and including the term in x^3 , simplifying the coefficients. (6 marks)

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 \dots, \text{ where } n \text{ is rational and } |x| < 1$$

(b) Solve the equation $2 \cos^2 x = 3 \sin x + 1$ for $0^\circ < x < 360^\circ$. (6 marks)

(c) Given $f(x) = e^x \ln x$, find $f'(x)$ and $f''(x)$. (7 marks)

(d) Find $\frac{dy}{dx}$ for $2x^2 + y - xy^2 + 3 = 4x$ by using implicit differentiation. (6 marks)

Question 3

- (a) Given that $f(x) = 1 - 2x$, $x \in \mathfrak{R}$ and $g(x) = x^2 - 1$. Find
- the function of $gf(x)$, (3 marks)
 - the value of x if $gf(x) = 2f(x)$. (4 marks)
- (b) In a triangle ABC , $AB = 10\text{cm}$, $BC = x\sqrt{3}\text{cm}$, $AC = 5\sqrt{13}\text{cm}$ and $\angle ABC = 150^\circ$. Find the value of x . (4 marks)
- (c) Differentiate each of the following with respect to x :
- $(4x+1)^3 \cos x$. (3 marks)
 - $\frac{e^x}{\cot x}$. (3 marks)
- (d) Find each of the following:
- $\int \frac{1}{(x-2)^2} dx$. (2 marks)
 - $\int \frac{x^2+1}{x} dx$. (2 marks)
- (e) Evaluate $\int_2^5 \frac{x+1}{x^2+2x} dx$. (4 marks)

Question 4

- (a) Consider the curve given by $f(x) = x^3 - 3x^2$.
- Find the coordinates of the stationary points. (4 marks)
 - Determine the nature of the stationary points. (4 marks)
 - Find all values of x for which $\frac{d^2y}{dx^2} = 0$. (5 marks)
 - Sketch the graph of the curve $y = f(x)$, label all the stationary points, and the x -intercept. (6 marks)
 - Find the values of x for which the curve $y = f(x)$ is concave down. (1 mark)
- (b) By using integration by parts, show that $\int_0^1 (1-x)e^{\frac{1}{2}x} dx = 4e^{\frac{1}{2}} - 2$. (5 marks)