INTI International College Penang

FINAL
Alternative Assessment

Session	:	**January 2021**
Programme	:	Foundation in Science (CFSI)
Course	:	**MAT1210: Mathematics 1**
Date of Examination	:	11 March 2021 (Thursday)
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 handwritten showing all steps in either **BLUE/BLACK** ink on foolscap papers. All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Formula Booklet 1

Examiner(s)	:	**Ms. Teng Mei Tuan**
Chief Moderator	:	Mr. Teo Chun Yew

*This paper consists of **4** printed pages, including the cover page.*

FOUNDATION IN SCIENCE (CFSI)
MAT1210: MATHEMATICS 1
FINAL ALTERNATIVE ASSESSMENT: JANUARY 2021 SESSION

Instructions: This paper consists of **FOUR (4)** questions. Answer **ALL** the questions handwritten showing all steps in either **BLUE/BLACK** ink on foolscap papers. All questions carry equal marks.

Question 1

(a) Find the exact solution for the following equations:

(i) $27^{x+3} = 81^{2x-5}$. (4 marks)

(ii) $\ln(x-1)^2 = 1 + \ln(x-1)$. (3 marks)

(b) Solve the equation $-\sqrt{3}\sec 2x = 2$, for $0 < x \le 2\pi$. (5 marks)

(c) Solve the radical equation $\sqrt{x} + \sqrt{x+1} = 4$. (4 marks)

(d) Rationalize the denominator of $\dfrac{\sqrt{2}+\sqrt{5}}{\sqrt{2}-5}$. (3 marks)

(e) 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)

Question 2

(a) Solve the equation $2\cot^2 x = 5\csc x$, for $0° \le x \le 360°$. (6 marks)

(b) Given that $f(x) = x - 1, x \in \Re$ and $g(x) = (x-1)^2, x \ge 1$. Find

(i) the function $fg(x)$, (2 marks)

(ii) the inverse function of $fg(x)$, and determine its domain. (4 marks)

(c) Differentiate each of the followings with respect to x, simplify and factorise the answer:

(i) $(\ln x)^2 e^{2x}$. (3 marks)

(ii) $\dfrac{(2x-1)^3}{\cos x}$. (4 marks)

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

Question 3

(a) Consider the curve given by $f(x) = x^3 - x^2 - x + 1$.

(i) Find the coordinates of the stationary points. (4 marks)

(ii) Determine the nature of the stationary points. (4 marks)

(iii) Find the coordinates of the point of inflection. (3 marks)

(b) An open rectangular box is to be made from a piece of cardboard 15 cm long and 8 cm wide by cutting a square from each corner and bending up the sides. Find the side of the square that needs to be removed from each corner in order for the box to have the largest volume. (4 marks)

(c) Find each of the followings:

(i) $\int \frac{1+x+x^2}{x}\,dx$. (4 marks)

(ii) $\int \cos x e^{\sin x}\,dx$, by using the substitution method. (3 marks)

(d) Evaluate the definite integral for $\int_{\frac{1}{2}}^{1} \frac{2x}{4-x^2}\,dx$, leaving your answer into a single logarithm. (3 marks)

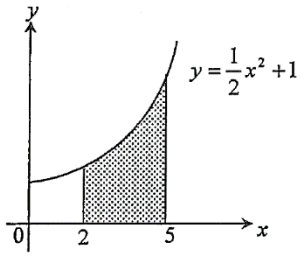
Question 4

(a) Evaluate the following definite integrals, correct your answers to 4 decimal places.

(i) $\int_0^{\frac{\pi}{4}} \sin^2 x \cos^3 x \, dx$. (6 marks)

(ii) $\int_0^{\frac{\pi}{2}} \sin^2 x \, dx$. (5 marks)

(b) The diagram below shows a shaded region bounded by the curve $f(x) = \frac{1}{2}x^2 + 1$, the x-axis and the straight line x =2 and x = 5.



(i) Find the area of the shaded region. (3 marks)

(ii) The shaded region is rotated through $360°$ about the x-axis to form a solid. Find the volume of the solid. (4 marks)

(c) By using integration by parts, show that $\int_0^1 x^2 e^x dx = e - 2$. (7 marks)

~THE END~