INTI International College Penang

FINAL
Alternative Assessment

Session	:	**April 2021**
Programme	:	Foundation in Science (CFSI)
Course	:	**MAT1210: Mathematics 1**
Date of Examination	:	27 July 2021 (Tuesday)
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 :

Nil

Examiner(s)	:	**Ms. Teng Mei Tuan**
Chief Moderator	:	Ms. Nadia Hanim Binti Abd Gahni

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

FOUNDATION IN SCIENCE (CFSI)
MAT1210: MATHEMATICS 1
FINAL ALTERNATIVE ASSESSMENT: APRIL 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) Rationalize the denominator of $\dfrac{2+\sqrt{6}}{\sqrt{6}-2}$. (3 marks)

(b) Solve the radical equation $\sqrt{2x+3}+\sqrt{x-2}=4$. (4 marks)

(c) Find the exact solution for the following equations:
(i) $2^{2x}-6\times 2^{x}+8=0$. (4 marks)

(ii) $\log_2 x+\log_x 2=2$. (3 marks)

(d) Show that $x+1$ is a factor of $P(x)=x^3+2x^2-5x-6$ and hence factorise the expression completely. (4 marks)

(e) Use the binomial theorem to expand the first three terms of $(1+3x)^7$ in ascending powers of x. (3 marks)

(f) A triangle ABC has side lengths AC = 9cm, BC = 8cm, the angle at C = 126° . Find the length of AB and the area of the triangle, correct the answer to 2 decimal places. (4 marks)

(Total: 25 marks)

Question 2

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

(b) Solve the equation $2+\sqrt{3}\csc 2x = 0$, for $0 < x \le 2\pi$. (4 marks)

(c) Solve the equation $\sin^2 x = \sin x$, for $0° < x < 360°$. (3 marks)

(d) Given that $f(x) = 3x+1, x \in \Re$ and $g(x) = x^2$. Find

(i) the values of function $fg(x) = gf(x)$, (4 marks)

(ii) the inverse function of $f(x)$. (3 marks)

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

(i) $(\ln x)^2(2x+1)^3$. (4 marks)

(ii) $\dfrac{e^{2x+1}}{\tan x}$. (4 marks)

(Total: 25 marks)

Question 3

(a) Find $\dfrac{dy}{dx}$ for $\sin(xy) = y^3 - xy^2 + 2x^2$ by using implicit differentiation. (7 marks)

(b) Consider the curve given by $f(x) = 5 - 9x + 6x^2 - x^3$.

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

(ii) Determine the nature of the stationary points. (3 marks)

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

(c) 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)

(d) Sketch the graph of the following equations $x = 0$, $x = y^2$ and $y = 3$. Hence find the area between them. (4 marks)

(Total: 25 marks)

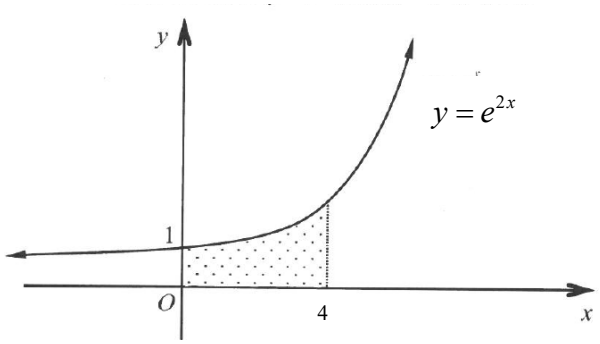
Question 4

(a) Find each of the followings:

(i) $\int \frac{1-x^2}{x}\,dx$. (3 marks)

(ii) $\int 3\cos x\left(2+\sin x\right)dx$, by using the substitution method. (4 marks)

(b)



The diagram shown part of the curve $y = e^{2x}$ and $x = 4$.
Find by showing all necessary working, the volume obtained when the shaded region is rotated through $360°$ about the *x*-axis. (4 marks)

(c) Evaluate the following definite integrals, leave the answer in exact value.

(i) $\int_0^{\frac{\pi}{2}} \sin^3 x\,dx$. (5 marks)

(ii) $\int_0^{\frac{\pi}{4}} \sin^2 x\,dx$. (4 marks)

(d) By using integration by parts, show that $\int_{2\pi}^{3\pi} x\sin x dx = 5\pi$. (5 marks)

(Total: 25 marks)

~THE END~