

FINAL
Alternative Assessment

Session : August 2021

Programme : Foundation in Science (CFSI)

Course : **MAT1210: Mathematics 1**

Date of Examination : 7 December 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 :
Formula Booklet 1

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

Chief Moderator : Ms. Nurul Asyima Zulkeflee

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

FOUNDATION IN SCIENCE (CFSI)
 MAT1210: MATHEMATICS 1
 FINAL ALTERNATIVE ASSESSMENT: AUGUST 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) Solve the radical equation $\sqrt{2x+11} = \sqrt{5x+1} - 1$. (7 marks)
- (b) Find the exact solution for the following equations:
- (i) $x^{x\sqrt{x}} = (x\sqrt{x})^x, x \neq 0$. (5 marks)
- (ii) $\log_3 2x = \log_3 (8-x)$. (2 marks)
- (c) Show that $2x-5$ is a factor of $P(x) = 6x^4 - 15x^3 - 8x^2 + 20x$ and hence factorise the expression completely. (5 marks)
- (d) Use the binomial theorem to find the independent term of x for $\left(x - \frac{1}{x}\right)^6$. (2 marks)
- (e) Given $\tan x = \frac{5}{12}$ where x is in between 180° and 270° , find $\sin 2x$. (4 marks)

Question 2

- (a) Find the exact value of $\tan \frac{9\pi}{4}$ without using calculator. (3 marks)
- (b) Prove $\frac{\sin 3x}{\sin x} + \frac{\cos 3x}{\cos x} = 4 \cos 2x$. (4 marks)
- (c) Solve the equation $\sin 2x = \cos x$, for $0^\circ \leq x < 360^\circ$. (3 marks)
- (d) Given that $f(x) = 3x+1, x \in \mathfrak{R}$ and $g(x) = e^x, x \in \mathfrak{R}$.
- (i) Show that $f^{-1}g(x) = \frac{e^{ax} - b}{c}$, where a, b and c are integers. (3 marks)
- (ii) Hence, find the $f^{-1}g(\ln 4)$. (2 marks)
- (iii) Find the inverse function of $g(x)$. (2 marks)
- (e) Differentiate each of the followings with respect to x , simplify and factorise the answer:
- (i) $\cos^4 2x$. (4 marks)
- (ii) $\frac{-x}{\ln 2x}$. (4 marks)

Question 3

- (a) Find $\frac{dy}{dx}$ for $y^3 + x^3 = 4xy$ by using implicit differentiation. (7 marks)
- (b) Consider the curve given by $f(x) = x^4 - 4x^3$.
- (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) The radius of a spherical bubble is increasing at the rate of 0.2 cm/s. Find the rate of increase of volume when the radius is 6 cm. Give your answer in term of π .
(Volume of sphere = $\frac{4}{3}\pi r^3$) (4 marks)
- (d) Find the x -coordinate(s) of the intersection between $y = x^3$ and $y = 3x^2$. Hence, find the area of region enclosed by $y = x^3$ and $y = 3x^2$. (4 marks)

Question 4

- (a) Find each of the followings:
- (i) $\int \frac{1+x}{x} dx$. (3 marks)
- (ii) $\int \frac{x^3}{\sqrt{9x^4 + 4}} dx$, by using the substitution method. (4 marks)
- (b) Find the volume of the solid generated when the area enclosed by $y = x^2$, $y = 4$, and the y -axis are rotated through 360° about the x -axis. (4 marks)
- (c) Evaluate the following definite integral, giving your answer correct to 4 decimal places:
- (i) $\int_0^{\frac{\pi}{2}} \cos^3 x dx$. (5 marks)
- (ii) $\int_2^3 (x-1)e^{x^2-2x} dx$. (4 marks)
- (d) Evaluate the definite integral of $\int_1^{e^3} 2x \ln x dx$ by using integration by parts. (5 marks)

~THE END~