INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2019**
Programme	:	Foundation in Science (CFSI)
Course	:	**MAT1210 : MATHEMATICS 1**
Date of Examination	:	7 December 2019 (Saturday)
Time	:	11:00AM – 1:00PM Reading Time : Nil
Duration	:	2 hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. 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 **4** printed pages, including the cover page.*

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
MAT1210: MATHEMATICS 1
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Question 1

(a) Solve the following equations:

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

(ii) $(\ln x)^2 - \ln x^2 - 3 = 0$ (5 marks)

(b) Solve $\cos 2x = -\frac{\sqrt{3}}{2}$ for $0° < x < 360°$. (5 marks)

(c) Find the exact value of the following without using calculator:

(i) $\cos 660°$ (3 marks)

(ii) $\cot \frac{7\pi}{3}$ (3 marks)

(e) Rationalize the denominator of $\frac{3\sqrt{3}}{2\sqrt{3}-3}$. Hence, simplify the answer. (5 marks)

Question 2

(a) Solve the radical equation $\sqrt{2x+3} + \sqrt{x-2} = 4$. (6 marks)

(b) Use the factor theorem to proof that $x+1$ is a factor of $P(x) = 2x^3 - 3x^2 - 3x + 2$. Hence, factories the $P(x)$. (6 marks)

(c) Solve the equation $2\sin^2 x = \sqrt{3}\sin x$ for $0° < x < 360°$. (6 marks)

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

Question 3

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

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

(b) Given that $f(x)=5-3x, x\in\Re$ and $g(x)=x^2-1, x>0$. Find

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

(ii) the value of x if $gf(x)=g(x)$, (3 marks)

(iii) the inverse function of $g(x)$, and state the domain. (3 marks)

(c) Find $\frac{dy}{dx}$ for $x^2+y^2-2xy=3x-4$ by using implicit differentiation. (5 marks)

(d) Given the equation $\ln(x-5)-\ln x=1$, solve the x in exact solution. (4 marks)

Question 4

(a) Consider the curve given by $f(x)=x^4-x^3-2x^2+3x$.

(i) Find the coordinates of the stationary points. (5 marks)

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

(iii) Sketch the graph of the curve $y=f(x)$, label all the stationary points, and the x- intercept(s). (5 marks)

(iv) State the absolute minimum for $y=f(x)$. (1 mark)

(b) Differentiate each of the following with respect to x.

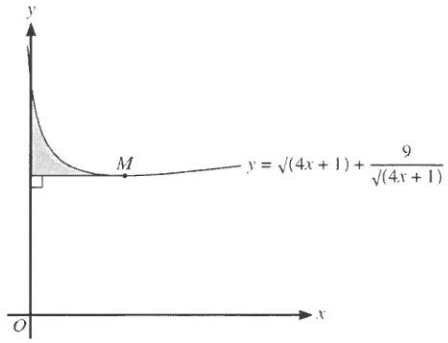
(i) $(e^x+2)^2\cos x$ (2 marks)

(ii) $\frac{\ln(x+1)}{e^x}$ (3 marks)

(c) Show that $\int_0^{\frac{\pi}{4}} x^2\cos 2x\,dx=\frac{1}{32}(\pi^2-8)$. (5 marks)

Question 5

(a) The diagram shows part of the curve $y = \sqrt{4x+1} + \dfrac{9}{\sqrt{4x+1}}$ and the minimum point M.



(i) Find the expression for $\dfrac{dy}{dx}$. (2 marks)

(ii) Find the coordinates of M. (4 marks)

(iii) Find the area of the shaded region. (5 marks)

(b) Evaluate each of the following:

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

(ii) $\displaystyle\int \left(\frac{x^2-2}{x}\right) dx$ (2 marks)

(iii) $\displaystyle\int_2^5 \frac{x}{x^2-2}\,dx$ (3 marks)

(iv) $\displaystyle\int_0^{\frac{\pi}{2}} \sin^3 x \cos^2 x\,dx$ (4 marks)

(c) Find the exact value of $\displaystyle\int_0^1 \frac{e^{3x}+4}{e^x}dx$. Show all necessary working. (4 marks)

~THE END~