INTI
International College Penang
LAUREATE INTERNATIONAL UNIVERSITIES

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2017**
Programme	:	Foundation in Science (CFSI)
Course	:	**MAT1210: Mathematics 1**
Date of Examination	:	12 December 2017 (Tuesday)
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 Scientific Calculator

Materials provided :

Formulae booklet 1

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

Moderator : Dr. Ch'ng Pei Eng

*This paper consists of **5** printed pages, including the cover page.*

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
MAT1210: MATHEMATICS 1
FINAL EXAMINATION: AUGUST 2017 SESSION

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Question 1

(a) Solve the radical equation $\sqrt{2x+11} = \sqrt{5x+1} - 1$. (9 marks)

(b) By letting $y = x - 2x^2$, use the Binomial Theorem to expand the first four terms of $(1 + x - 2x^2)^7$. (6 marks)

(c) Given that $D(x) = x + 2$ and $P(x) = x^3 - 4x^2 + 2x + 5$, find the quotient and remainder. Hence, express the answer in fractional form. (6 marks)

(d) Solve the equation $\log_2 y - \log_2 (y - 5) = 3$ (4 marks)

Question 2

(a) Given that $\tan\theta = \frac{1}{2}$ and θ is an acute angle, evaluate $\tan 2\theta$. (2 marks)

(b) Find the exact value of $\cos -420°$ without using a calculator. (2 marks)

(c) Solve the equation $\sec^2 x + 2\tan x - 6 = 0$ for $0° < x < 360°$. (8 marks)

(d) Prove that $\frac{\tan\theta + \cot\theta}{\sec\theta \csc\theta} = 1$. (4 marks)

(e) Prove the identity $\frac{\cos(\alpha - \beta)}{\sin\alpha \sin\beta} = \cot\alpha \cot\beta + 1$. (4 marks)

(f) Find the y-intercepts, x intercepts and the slopes of $4x - 6y - 12 = 0$. Hence, sketch the graph. (5 marks)

Question 3

(a) Given that the equation of a curve is $f(x) = -2x^3 + 3x^2$. Find

(i) Find the coordinate of the stationary points, (6 marks)

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

(iii) Find the point of inflexion, (3 marks)

(iv) Find the intersection point of the axes, (2 marks)

(v) Sketch the graph of $f(x)$ in the interval $-1 \le x \le 3$, (4 marks)

(vi) State the absolute minimum and the absolute maximum values of the curve in the interval $-1 \le x \le 3$. (2 marks)

(b) Given that $f(x) = 3x^2 + 1$ and $g(x) = 5x - 7, \quad x \in \Re$.

(i) Find $g^{-1}(x), \quad x \in \Re$. (2 marks)

(ii) Show that $fg(x) = ax^2 - bx + 148$. Hence, evaluate a and b. (3 marks)

Question 4

(a) Find $\frac{dy}{dx}$ for each of the following:

(i) $y = (\cos 3x)^4 \ln(x+1)$ (4 marks)

(ii) $y = \frac{e^{3x}}{1+2^x}$ (3 marks)

(b) Differentiate $2x^2 - 3y^2 = 2xy$ with respect to x by using implicit differentiation (4 marks)

(c) The volume , $V\ cm^3$, of the liquid in the bucket, when the depth of liquid is $x\ cm$, is given by

$$V = 0.01x^3 + 2.2x^2 + 200x$$

Find the depth of liquid when the liquid is poured into a bucket at a rate of 60 cm^3/sec and the rate of increase for the depth of liquid is 0.2 cm/sec. (5 marks)

(d) Find the equation of the tangent line to the curve $y = x^2 + 4x - 1$ at the point $(2, -13)$. (4 marks)

(e) Given the equation of the curve is $y = \frac{3x^2 - 8}{5 - 2x}$.

(i) Show that the gradient of the curve is $\frac{dy}{dx} = \frac{ax^2 + bx + c}{(5-2x)^2}$ where a, b, and c are integers. Evaluate a, b and c. (4 marks)

(ii) Find the value of $\frac{dy}{dx}$ when $x = 2$. (1 mark)

Question 5

(a) Find the indefinite integral of $\int \frac{x^3}{\sqrt{9x^2+4}} dx$ by using u-substitution. (9 marks)

(b) Find the area of the region bounded by $y = \frac{x^3}{8} + 2x$, $x = 2$, $x = 4$ and x-axis. (4 marks)

(c) Evaluate the definite integral of $\int_0^{\frac{\pi}{4}} x \sin 2x dx$ by using integration by parts. (9 marks)

(d) Evaluate $\int_{-1}^{2} (2x-4)^4 dx$. (3 marks)

~ The End ~

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