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INTERNATIONAL COLLEGE PENANG (507232-U)
LAUREATE INTERNATIONAL UNIVERSITIES

Final
Examination Paper

(COVER PAGE)

Session : January 2018

Programme : FOUNDATION IN SCIENCE (CFSI)

Course : **MAT1210: MATHEMATICS I**

Date of Examination : 3rd March 2018

Time : 0800am-1000am Reading Time : Nil

Duration : 2 Hours

Special Instructions :

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 :

Answer booklet and Booklet 1

Examiner(s) : **Mr. Michael Chong Sueng**

Moderator : **Dr. Ch'ng Pei Eng**

This paper consists of 6 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
MAT1210: MATHEMATICS I
FINAL EXAMINATION: JANUARY 2018 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Simplify the following expression.

(i) $(-3x^{-1}y^2)^2$ (2 marks)

(ii) $(-5x^{-2}y) \div (-2x^{-3}y^2)$ (3 marks)

(b) Simplify the following radicals.

(i) $(3\sqrt{x} - \sqrt{y})(2\sqrt{x} - 5\sqrt{y})$ (3 marks)

(ii) $\frac{5}{4\sqrt{x} + \sqrt{3}}$ (3 marks)

(c) Solve the following equations with your answer correct to four decimal places:

(i) $2(\log_4 x + \log_x 4) = 5$ (5 marks)

(ii) $5^{2x} - 5^{x+1} + 4 = 0$ (5 marks)

(iii) $4(3^x) = 5$ (4 marks)

Question 2

- (a) Given that $P(x) = ax^3 - 7x^2 + bx$ where a and b are constants, if $P(x)$ has a remainder of 4, when divided by $(x+1)$ and $(x-3)$ is a factor of $P(x)$, find the values of a and b .

(8 marks)

- (b) Use the Binomial Theorem to find the expansion of $(3-2x)^6$ up to and including x^3 .

(4 marks)

- (c) Prove each of the following identities.

(i) $\sec^4 x - \tan^4 x = 2 \tan^2 x + 1$

(4 marks)

(ii) $\frac{\tan^2 x - 1}{\tan^2 x + 1} = 1 - 2 \cos^2 x$

(5 marks)

- (d) Solve the equation $3 \sin^2 x - 2 \cos x - 3 = 0$, for $0^\circ < x < 180^\circ$

(4 marks)

Question 3

(a) If $\cos x = \frac{3}{5}$ is in Quadrant IV, use the trigonometric identities to find

(i) $\sin \frac{x}{2}$

(3 marks)

(ii) $\cos 2x$

(3 marks)

(b) If $f(x) = \frac{3x-5}{x+5}$ and $g(x) = 2x^2 - 7x$, find the following functions along with the domain.

(i) $(f \circ g)(x)$

(3 marks)

(ii) $(f \bullet g)(x)$

(3 marks)

(c) Find the inverse function of $f(x) = \frac{6-10x}{8x+7}$, hence verify that $(f \circ f^{-1})(x) = x$.

(7 marks)

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

(i) $f(x) = x^5 \sin x$

(2 marks)

(ii) $f(x) = \frac{4x^2}{(x+4)}$

(2 marks)

(iii) $f(x) = 2x^3 + (x-7) - e^{2x}$

(2 marks)

Question 4

(a) Solve the following questions.

(i) Find the $\frac{dy}{dx}$ for $x^3 + y^3 = 7$.

(3 marks)

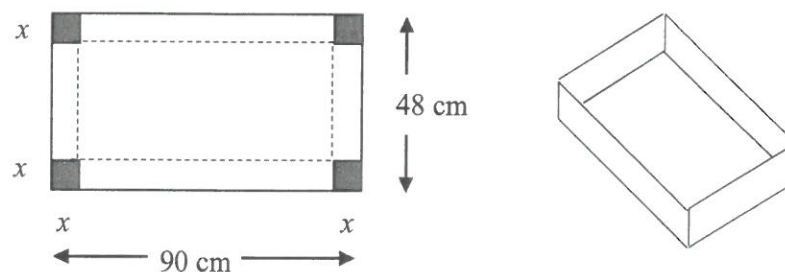
(ii) Find the $\frac{dy}{dx}$ for $y = 5 \sin^3(3x^2)$

(3 marks)

(iii) Find the $\frac{d^2y}{dx^2}$ for $y = 4x^3(e^{2x})$

(2 marks)

(b) Squares with sides of length x are cut from the corners of a rectangular piece of sheet metal with dimensions of 48 cm by 90 cm where the metal is then folded along the dotted lines to make an open top box as seen in the following figure.



(i) Write a function $V(x)$ that gives the volume of the box.

(2 marks)

(ii) Please state the domain of the function $V(x)$.

(2 marks)

(iii) With the function $V(x)$, find the stationary points.

(4 marks)

(iv) Find the local maximum and local minimum, hence give the dimension such that the box will have the greatest possible volume.

(5 marks)

(c) Solve the definite integral $\int_0^3 xe^x dx$.

(4 marks)

Question 5

(a) By writing the integrand as its partial fractions find $\int \frac{8x+10}{4x^2+8x+3} dx$ (11 marks)

(b) Solve the following questions:

(i) Find the area of the region bounded between the curves $y = x^2$ and $y = x^3$ (7 marks)

(ii) Find the volume of the solid of revolution when the region bounded between the curve $y = 3x$ and $y = x^2$ is revolved about the x -axis. (7 marks)

~ The End ~

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