

**FINAL**  
Examination Paper

(COVER PAGE)

Session : August 2018

Programme : Foundation in Science (CFSI)

Course : **MAT1210 : MATHEMATICS 1**

Date of Examination : 7 December 2018 (Friday)

Time : 2:00PM – 4:00PM 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 & Graph Paper

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

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

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

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 FOUNDATION IN SCIENCE (CFSI)  
 MAT1210: MATHEMATICS 1  
 FINAL EXAMINATION: AUGUST 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) Solve the exponential equation  $2^{x^2+5x} = \frac{1}{2^6}$ . (4 marks)
- (b) Solve  $\sec 2x = -2$  for  $0^\circ < x < 360^\circ$ . (6 marks)
- (c) Find the remainder, when  $P(x) = x^3 - 2x^2 + 2x + 3$  is divided by  $x + 1$ . (2 marks)
- (d) Find the exact value of the following without using calculator:
- (i)  $\sin 600^\circ$  (3 marks)
- (ii)  $\tan \frac{8\pi}{3}$  (3 marks)
- (e) Evaluate the indefinite integral of  $\int (2x + 2)e^{x^2+2x+3} dx$  by using substitution method. (7 marks)

**Question 2**

- (a) Solve the radical equation  $\sqrt{3x-5} = 2 - \sqrt{x-1}$ . (6marks)
- (b) Use the factor theorem to determine if  $5x - 2$  is a factor of  $P(x) = 6x^4 - 15x^3 - 6x^2 + 20x$ . (2 marks)
- (c) Solve the equation  $1 - \sin^2 x = \cos x$  for  $0^\circ < x < 360^\circ$ . (4 marks)
- (d) Solve the equation  $\log_3 9x = \frac{1}{2} - \log_9 x$ . (3 marks)
- (e) Given  $f(x) = e^{2x} \cos 2x$ , find  $f'(x)$  and  $f''(x)$ . (5 marks)
- (f) Use implicit differentiation to find  $\frac{dy}{dx}$  for  $y^2 = y \sin x$ . (5 marks)

**Question 3**

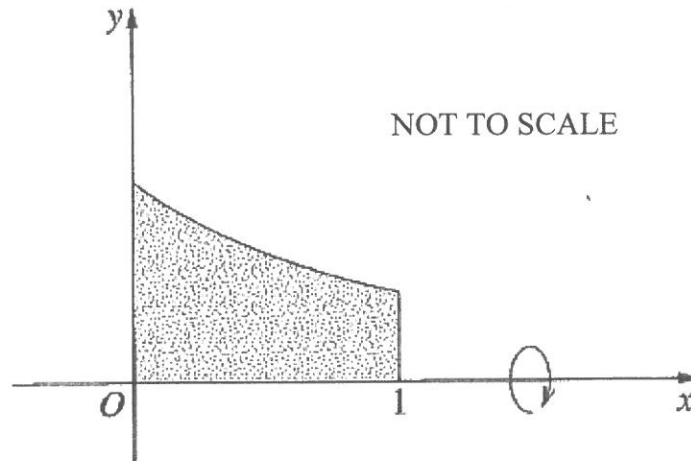
- (a) Rationalize the denominator of  $\frac{\sqrt{3} + \sqrt{4}}{3 - \sqrt{4}}$ . (4 marks)
- (b) Given that  $f(x) = x + 1, x \in \mathbb{R}$  and  $g(x) = \frac{5 + 3x}{2 - x}, x \neq 2$ . Find
- (i) the value of  $f(3) + g(-5)$ , (2 marks)
  - (ii) the function of  $fg(x)$ , (3 marks)
  - (iii) the inverse function of  $f(x)$ , (3 marks)
  - (iv) the value of  $f^{-1}(2)$ . (2 marks)
- (c) Evaluate the definite integral of  $\int_0^{\frac{\pi}{4}} x \sin 2x \, dx$  by using integration by parts. (8marks)
- (d) Given the equation  $\ln(4 + e^{-x}) = 6$ , solve the  $x$  in exact solution. (3marks)

**Question 4**

- (a) Given the curve given by  $f(x) = (x - 2)e^x$  has one stationary point.
- (i) Find the exact coordinates of the stationary point. (4 marks)
  - (ii) Determine the nature of the stationary point. (4 marks)
  - (iii) Sketch the curve, label all the stationary points,  $y$ - intercept and end points. (5 marks)
  - (iv) State the interval of  $x$ , where  $f(x)$  is an increasing function. (2 marks)
- (b) By using implicit differentiation, differentiate  $x^3 + y^3 = 9xy$  with respect to  $x$ .  
Find  $\frac{dy}{dx}$ . (5 marks)
- (c) Evaluate the definite integral of  $\int_0^{\frac{\pi}{6}} (\cos 2x + \sin x) \, dx$ . (5 marks)

**Question 5**

- (a) The diagram shows the region bounded by  $y = \frac{1}{x+4}$ , the  $x$ -axis, the  $y$ -axis, and the line  $x = 1$ .



- (i) Find the area of the shaded region. (4 marks)
- (ii) The shaded region is rotated about the  $x$ -axis to form a solid. Find the volume of the solid. (4 marks)
- (b) Evaluate  $\int_0^1 \frac{x}{x^2+4} dx$ . (3 marks)
- (c) Evaluate  $\int_0^1 (x+4) dx$ . (3 marks)
- (d) Differentiate with respect to  $x$ .
- (i)  $\cos^3 x \ln x^2$  (2 marks)
- (ii)  $\frac{e^{3x}}{\sin x}$  (3 marks)
- (e) Expand  $(3 + \frac{x}{2})^5$  in ascending powers of  $x$  up to and including the term in  $x^3$ , simplifying the coefficients. (6 marks)