

ST. STEPHEN'S GIRLS' COLLEGE
Final Examination 2018 - 19

Form 4

LC

13 students

Mathematics Extended Part Module 1 (Calculus and Statistics)

Time allowed: 45 minutes

Total marks: 35

Question/Answer Paper

Please read the following instructions very carefully.

1. Write your class, class number and name in the spaces provided on this cover.
2. Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question/Answer Paper.
3. Unless otherwise specified, all working must be clearly shown.
4. Unless otherwise specified, numerical answers should be exact or given to 4 decimal places.

Class	
Class No.	
Name	

	Marker's Use Only
1	
2	
3	
4	
5	
Total	/35

1. Define $f(x) = \frac{7x-9}{4x+1}$ for all $x > -\frac{1}{4}$.

(a) Prove that $f(x)$ is increasing.

(b) Find $\lim_{x \rightarrow \infty} f(x)$.

(4 marks)

2. Define $h(x) = x^2 6^{-x}$ for all real number of x . Someone claims that all the roots of the equation $h'(x) = 0$ are rational numbers. Do you agree? Explain your answer. (4 marks)

3. (a) Expand e^{-10x} in ascending powers of x as far as the term in x^2 .
- (b) Let n be a positive integer and a be a constant. If the coefficients of x and x^2 in the expansion of $e^{-10x}(1+ax)^n$ are -14 and 96 respectively, find a and n . (7 marks)

4. Consider the curve $C: y = (x - 6)\sqrt{2x + 4}$ where $x > -2$.
- (a) Find $\frac{dy}{dx}$.
- (b) C cuts the x -axis and y -axis at point A and point B respectively. Find the coordinates of A and B respectively. Hence, find the equations of the tangents to curve C at point A and point B respectively.
- (c) Someone claims that curve C has one and only one local maximum. Do you agree? Explain your answer. (10 marks)

5. The number of people (N) in a town who have suffered from influenza is given by

$$N = \frac{4000}{5 + ae^{kt}}$$

where t (≥ 0) is the number of days after an outbreak and a and k are constants.

- (a) Express $\ln\left(\frac{4000}{N} - 5\right)$ as a linear function of t . (1 mark)
- (b) It is given that the graph of the linear function obtained in (a) has a slope -0.4 and it passes through $(0, \ln 45)$.
- (i) Find a and k .
- (ii) Find the number of people suffered from influenza initially.
- (iii) Estimate the total number of people who suffered from influenza in this outbreak.
- (iv) Find $\frac{dN}{dt}$.
- (v) Describe how N varies during the first 10 days after the outbreak. Explain your answer. (9 marks)

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