LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **MATHEMATICS**

FIRST SEMESTER – NOVEMBER 2012

# MT 1502 - ALGEBRA AND CALCULUS - I

 Date : 08/11/2012 Dept. No. Max. : 100 Marks

 Time : 1:00 - 4:00

**PART - A**

**ANSWER ALL QUESTIONS: (10x2=20)**

1. Find the nth derivative of 

2. Show that, in the curve, the polar sub tangent varies as the square of the

 radius vector and the polar subnormal is a constant.

3. Write the conditions for maxima and minima of two variables.

4. What is the radius of curvature of the curve  at the point (1, 1)?

5. Find the co-ordinates of the centre of curvature of the curve at the point

 (2, 1).

6. Form a rational cubic equation which shall have the roots 1, 

7. If are the roots of the biquadratic equation 

 find 

8. State Newton’s theorem on the sum of the powers of the roots.

9. State Descartes’ rule of signs for negative roots.

10. Determine if Cardon’s method can be applied to solve the equation 

 **PART - B**

**ANSWER ANY FIVE QUESTIONS: (5x8=40)**

11. a) Find the angle at which the radius vector cuts the curve 

 b) Find the slope of the tangent with the initial line for the cardioid 

 at  (4 + 4)

12. Discuss the maxima and minima of the function 

13. Prove that the (p-r) equation of the cardioid is  and hence

 prove that its radius of curvature is 

14. Show that the evolute of the cycloid ;  is another

 cycloid.

15. Solve the equation 

16. Show that the sum of the eleventh powers of the roots of is zero.

17. a) If are the roots of the equation find the value of

 

 b) Determine completely the nature of the roots of the equation

  (5 + 3)

18. If be a real root of the cubic equation of which the coefficients

 are real, show that the other two roots of the equation are real, if 

 **PART - C**

**ANSWER ANY TWO QUESTIONS: (2 x 20 = 40)**

19. a) Find the nth differential coefficient of .

 b) If, prove that  (10 +10)

20. A tent having the form of a cylinder surmounted by a cone is to contain a given

 volume. If the canvass required is minimum, show that the altitude of the cone is

 twice that of the cylinder.

21. a) Find the asymptotes of 

 b) Show that the roots of the equation  are in Arithmetical

 progression if  Show that the above condition is satisfied by the

 equation and hence solve it. (10 + 10)

22. Determine the root of the equation  which lies between 1 and 2

 correct to three places of decimals by Horner’s method.

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