

NAMILYANGO COLLEGE

B.O.T 1 EXAMS

S.6 MATHEMATICS P 425/1

TIME: 3 HOURS

Attempt ALL questions.

1. (a) Solve the simultaneous equations

$$\begin{aligned} 2x - y &= 5 \\ x^2 + xy &= 2 \end{aligned}$$

- (b) Solve the equations

$$x^2 + 3x - 2 = \frac{8}{(x^2 + 3x)}$$

2. If α and β are the roots of $ax^2 + bx + c = 0$ show that

$$\alpha^2 - \beta^2 = \frac{-b\sqrt{b^2 - 4ac}}{a^2}$$

3. Prove by induction that

$$\sum_{r=1}^n \frac{1}{r(r+1)} = \frac{n}{n+1}$$

4. Solve the equation

$$\begin{aligned} 12 \sin \theta - 5 \cos \theta &= 6.5 \\ \text{for } -180^\circ \leq \theta \leq 180^\circ \end{aligned}$$

5. The ratio of the sum of the first 6 terms of a G.P to the sum of the first 3 terms is 7:8. The second term of the series is $\frac{1}{4}$. Calculate the common ratio and the first term

6. Determine the turning point and its nature of the curve

$$y = \frac{1}{x(x-1)}$$

7. Prove that $\log_2 \frac{1}{(320)} + \frac{1}{\log_{10} 2} + 5 = 0$

8. If $(X^2 - X - 6)$ is a factor of the polynomial $X^4 + ax^3 - 9X^2 + bx - 6$ find the values of a and b

9. Prove the identity

$$\frac{2 \tan \theta}{1 - \tan^2 \theta} = \frac{2 \sin \theta \cos \theta}{\cos^2 \theta - \sin^2 \theta}$$

10. If X is real and $4X^2 + 2KX + 8 - K = 0$. Show that K cannot lie between certain limits and find these limits.

11. (a) Solve the equation
 $\tan^{-1} X + \tan^{-1}(1 - x) = \tan^{-1} \left(\frac{9}{7} \right)$

(b) Prove that $16 \sin^5 \theta = \sin 5\theta - 5 \sin 3\theta + 10 \sin \theta$

12. (a) Solve the equation

$$\sqrt{x+2} + \sqrt{x-5} = \sqrt{3x+7}$$

(b) An inverted right circular cone has a slant length of 6cm. Find the height of the cone which its volume is maximum, if water is poured in the cone at a rate of $2\text{cm}^3\text{s}^{-1}$, find;

(i) the rate of increase of the surface area of water when the slant length is 4cm.

(ii) the time taken for the water to fill the cone

13. ABCD is a quadrilateral with A(2, -2) B(5, -1) C(6, 2) and D(3, 1)
 Show that the quadrilateral is a rhombus.