

**P425/1**

**PURE MATHEMATICS**

**Paper 1**

**3 hours**

**INTERNAL MOCK EXAMINATIONS 2024**  
**UGANDA ADVANCED CERTIFICATE OF EDUCATION**  
**PURE MATHEMATICS**

**PAPER 1**

**3 HOURS**

**INSTRUCTIONS TO CANDIDATES**

- ✓ Answer all eight questions in section A and any five questions in section B
- ✓ All necessary working must be shown clearly
- ✓ Begin each answer on a fresh on a fresh sheet of paper
- ✓ Graph paper is provided
- ✓ Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used

## SECTION A

1. Solve  $\log_5 x + 2 \log_x 5 = 3$
2. Solve the equation  
 $9^x - 3^{x+1} = 10$
3. If the roots of the equation  $x^2 + 2x + 3 = 0$  are  $\alpha$  and  $\beta$  form an equation whose roots are  
 $\alpha^2 - \beta$  and  $\beta^2 - \alpha$
4. Expand the roots  $(1-x)^{1/3}$  as far as the term in  $x^3$ . Hence evaluate  $\sqrt[3]{24}$
5. A curve is defined by the parametric equations

$$x = t^2 - t$$

$$y = 3t + 4$$

Find the equation of the tangent to curve at (2, 10)

6. The equation of the circle with center O is given by  $x^2 + y^2 + Ax + By + c = 0$  Where A, B, and C are constants. Given that  $4A = 3B$ ,  $3A = 2C$  and  $C = 9$ . Determine the coordinates of the Centre of the circle hence radius of the circle.
7. Solve the equation  $3\cos \theta \leq \theta \leq 360^\circ$
8. Solve Cartesian equations of the plane passing through the points A(1, 0, 2), B(3, 1, 1) parallel to the line  $r = 3\mathbf{i} + (2 - 1)\mathbf{j} + (5 - \alpha)\mathbf{k}$

## SECTION B

Answer any five questions from this section.

All questions carry equal marks

9. (a) Given that  $z = 52i$ , find the modulus  $z^{*-3}/2$  where  $z^*$  is the conjugate of  $z$   
 (b) Given that  $\left| \frac{3z+1}{2z-i} \right| = \sqrt{2}$ , find the locus of  $z$  and describe the locus
10. (a) Show that  $\frac{\sin \theta - 2 \sin 2\theta + \sin 3\theta}{\sin \theta + 2 \sin 2\theta + \sin 3\theta} = \tan^2 \frac{\theta}{2}$   
 (b)  $\sin x - \sin 4x = \sin 2x - \sin 3x$  for  $\pi \leq x \leq 2\pi$ .
11. Express  $\frac{2-x+x^2}{(1+x)(1-x)^2}$  in partial fractions Hence evaluate

$$\int_0^2 \frac{2-x+x^2}{(1+x)(1-x)^2} dx \text{ correct to three decimal places}$$

12. (a) Differentiate  $y=2x^2+3$  from first principles.

(b) A side of a cube is increasing at a rate of 6cm/s. Find the rate of increase in the volume of the cube when the length of the side is 8cm

13. Given that  $y = \frac{4x-10}{x^2-4}$ ,

(a) Find the range of values where the curve doesn't lie

(b) Determine the stationary points of the curve

(c) State the equation of the three asymptotes of the curve sketch the curve

14. Evaluate

$$(a) \int_0^{\frac{\pi}{2}} \sin 5x \cos 3x dx$$

$$b) \int_0^{\frac{\sqrt{3}}{2}} \frac{dx}{9+4x^2}$$

15.(a) The tenth term of an arithmetic progression (A.P) is 29 and the fifteenth term is 44. Find the value of the common difference and the first term. Hence find the sum of the first 60 terms.

b). A cable 10 cm long is divided into 10 pieces whose lengths are in geometric progression. The length of the longest piece is 8 times the lengths of the shortest piece. Calculate the nearest centimeter the length of the third piece.

16. The rate at which a radioactive nuclei decay is proportional to number of such nuclei that are present in a given sample. Half of the original number of radioactive nuclei has undergone disintegration in the period of 1500 years.

(a) What percentage of the original radioactive nuclei will remain after 300 years

(b) In how many years will one tenth of the original number remain?

THE END

