

P425/1
PURE MATHEMATICS
Paper 1
April. 2025
3 hours



NAKAWA UNION VISION SECONDARY SCHOOL
Uganda Advanced Certificate of Education

END OF TERM I EXAMINATIONS 2025

PURE MATHEMATICS

Paper 1

3 hours

INSTRUCTIONS TO CANDIDATES;

This paper consists of two sections; **A** and **B**. **Section A** is compulsory.

Answer only five questions from section B.

Any additional question(s) answered will not be marked.

All necessary working **must** be shown clearly.

Begin each answer on a fresh page.

Graph paper is provided.

Silent, non-programmable scientific calculators and mathematical tables with list formulae may be used.

SECTION A (40 MARKS)

Answer **all** the questions in this section.

1. Solve the equation $\log_2^x - \log_x^8 = 2$. (05 marks)
2. Prove the identity $\frac{\sec \theta \sin \theta}{\tan \theta + \cot \theta} = \sin^2 \theta$. (05 marks)
3. If $y = e^{\tan^{-1} x}$, Show that $(1 + x^2) \frac{d^2 y}{dx^2} + (2x - 1) \frac{dy}{dx} = 0$. (05 marks)
4. Find the perpendicular distance of a point P (3,1,7) from the line $r = 3i + j - 2k + \lambda(2i - j + 2k)$. (05 marks)
5. Calculate the total area bounded by the curve, $y = 3x^2 - 6x$ the x - axis and the lines $x = -1$ and $x = 2$. (05 marks)
6. Find the possible values of k if the quadratic equation $2kx^2 - 8x + 1 = 2k(x - 2)$ has equal roots. (05 marks)
7. Using Maclaurin's theorem, expand $y = x + \ln(1 + x)$ as far as the term in x^3 . (05 marks)
8. Determine the equation of the circle with centre at (1,5) and has a tangent passing through the points A (-1, 2) and B (0, -2). (05 marks)

SECTION B (60 MARKS)

Answer any **five** questions from this section

9. (a) Solve the equation $5 \sin \theta - \cos 2\theta + 3 = 0$ for values of θ in the range $0^\circ \leq \theta \leq 360^\circ$. (05 marks)
- (b) Given that where A is a $\cos A = \frac{-8}{17}$ and $\tan B = \frac{5}{11}$ reflex angle and B is an acute angle. Without using tables or calculator, find the value of $4 \sin A + 5 \sin B$. to three significant figures. (07 marks)
10. (a) Given that:
 $f(x) = 2x^3 - 3x^2 - 11x + 6$, and $f(3) = 0$
factorise $f(x)$. (05 marks)
- (b) Show that $\sqrt{\frac{1+2x}{1-x}} = 1 + \frac{2}{3}x + \frac{3}{8}x^2 + \dots \dots \dots$ By substituting $x = 0.02$, deduce the value of $\sqrt{13}$ to 3 significant figures. (07 marks)
11. The curve is given parametrically by the equation $x = \frac{t}{1+t}$ and $y = \frac{t^2}{1+t}$
- (a) Find the Cartesian equation of the curve. (02 marks)
- (b) Determine the turning points of the curve. (04 marks)
- (c) Sketch the curve. (04 marks)
12. (a) Use the mathematics of small changes to evaluate $\sin 29.5^\circ$ to 4dps. (05 marks)
- (b) A right circular cone has a slant length of $9\sqrt{3}$ cm. calculate the maximum volume of the cone: and state the corresponding values of the height and radius in this case. (07marks)

13. Given that $r_1 = \begin{pmatrix} 6 \\ -1 \\ 2 \end{pmatrix} + \lambda \begin{pmatrix} 3 \\ -2 \\ -1 \end{pmatrix}$ and $r_2 = \begin{pmatrix} 7 \\ 3 \\ -3 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 1 \\ -3 \end{pmatrix}$

- (a) Find the coordinates of their point of intersection. (04 marks)
- (b) Calculate the acute angle between the lines. (04 marks)
- (c) Find the Cartesian equation of the plane containing the lines. (04 marks)

14. (a) Given that, $Z_1 = \frac{7-i}{3-4i}$
Express Z_1 in the form $a + bi$. Hence or otherwise express Z_1 in polar form. (05 marks)

- (b) Find the equation of the locus $|Z + Z_1 - 2| = 3$, given that $Z = x + iy$, hence Sketch the locus above. (07 marks)

15. (a) If, $y = \sin^{-1}\left(\frac{x}{\sqrt{1+x^2}}\right)$ Show that $\frac{dy}{dx} = \frac{1}{1+x^2}$ (05 marks)

16. Evaluate $\int \frac{x^2+2x-2}{(x^2+2)(x+1)} dx$ (07 marks)

17. (a) Find the length of the tangent from (5,7) to the circle $x^2 + y^2 - 4x - 6y + 9 = 0$ (05 marks)

- (b) A circle touches both x-axis and the line $4x - 3y + 4 = 0$. Its centre is in the first quadrant and lies on the line $x - y - 1 = 0$.

Prove that its equation is. $x^2 + y^2 - 6x - 4y + 9 = 0$

(07 marks)

END