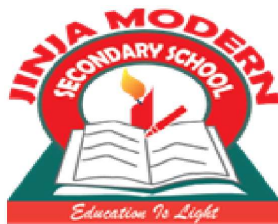# JINJA MODERN SECONDARY SCHOOL

SENIOR FIVE END OF TERM 1 EXAMINATIONS 2024

P425/1 PURE MATHEMATICS

Duration: 3 Hours

- Attempt all questions in section A and any 5 questions in section B

Section A

1. Solve the equation $3\tan^2\theta + 2\sec^2\theta = 2(5 - 3\tan\theta)$ for $0^0 \leq \theta \leq 180^0$

   (05 marks)

2. Given that $\int_0^x (y^2 + 2y - 6)dy = 0$ Find the value of x

   (05 marks)

3. Solve the simultaneous equations
$$2x - y + 3z = 10$$
$$x + 2y - 5z = 9$$
$$5x + y + 4z = 11$$

   (05 marks)

4. Show that from first principles, $\frac{d}{dx}(\tan x) = \sec^2 x$

   (05 marks)

5. Find the square root of $14 + 6\sqrt{5}$

   (05 marks)

6. Differentiate $\log_8 x^2$

   (05 marks)

7. Solve the equation; $\sqrt{(3 - x)} - \sqrt{(7 + x)} = \sqrt{16 + 2x}$

   (05 marks)

8. Find the equation of a line through the point $(2, 3)$ and perpendicular to the line $x + 2y + 5 = 0$

   (05 marks)

SECTION B (Attempt any 5 questions)

9. Solve the following simultaneous equations

   a) $\frac{x^2}{y} + \frac{y^2}{x} = 9$, $\frac{1}{x} + \frac{1}{y} = \frac{3}{4}$ (05 marks)

   b) $\frac{1}{x+y} + \frac{2}{x-y} = 8$, $x^2 - y^2 = \frac{1}{6}$ (04 marks)

10. (a) Show that $\frac{d}{dx}(\cot^{-1} x) = \frac{-1}{1+x^2}$ (06 marks)

    (b) Given that $R = q\sqrt{(1000 - q^2)}$ Find

      (i) $\frac{dR}{dq}$

      (ii) value of q when R is maximum

11. Find (a) $\int_0^1 \frac{x^3}{1+x^8} dx$

    (08 marks)

    (b) $\int_0^{\pi/2} \sin 2\theta \cos \theta \, d\theta$

12. Given the equation $x^3 + x - 10 = 0$

    a) Show that $x = 2$ is the root of the equation

    b) Deduce the values of $(\alpha + \beta)$ and $\alpha\beta$ where α and β are the other roots of the equation hence form a quadratic equation whose roots are α^2 and β^2

13. Solve for x in the following equations

    a) $9^x - 3^{(x+1)} = 10$ (06 marks)

    b) $\log_4 x^2 - 6\log_x 4 - 1 = 0$ (06 marks)

14.   a)   Prove that $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$

         Hence show that $\frac{1-\tan 15^0}{1+\tan 15^0} = \frac{1}{\sqrt{5}}$

       b)   Given that $\cos A = \frac{3}{5}$ and $\cos B = \frac{12}{13}$ where A and B are acute, find the value of
       I) $\tan(A + B)$
       II) $\text{Cosec}(A + B)$

15. a) Find the equation of the tangent to the curve $x^3 + 2y^3 + 3xy = 0$ at the point $(2, -1)$ (05 Marks)

    b) Differentiate with respect to x

         (i) $(\sin x)^x$ (ii) $\frac{(x^2+1)}{(x+1)^3}$

Welcome to Advanced Level