Pure Mathematics

Section A

1- Differentiate $\ln 3\cos^2 x$ with respect to x

2- Solve $2\cos 2\theta - 5\cos\theta = 4$ for $0° \leq \theta \leq 360°$

3- Given that $\alpha\beta = -1/3$ and $\alpha\beta = 2/3$. Form a quadratic equation whose roots are α/β and β/α.

4- Solve the simultaneous equations

$$x - 2y - 2z = 0$$
$$2x + 3y + z = 1$$
$$3x - y - 3z = 3$$

5- Solve the equation $\sqrt{2x+5} - \sqrt{x+1} = \sqrt{x-2}$

6- Differentiate $\log_{e^{\tan x}} 5 \sin^2 x$

7- Show that $2\log 4 + \frac{1}{2}\log 25 - \log 20 = 2\log 2$

8- In a triangle ABC, $a = 7cm$, $b = 4cm$ and $c = 5cm$. Find the value of

(a) $\cos A$

(b) $\sin A$

SECTION B.

9- Solve; (a) $4\sin^2\theta - 12\sin 2\theta + 35\cos^2\theta = 0$ for $0° \leq \theta \leq 360°$

(b) $3\cos\theta - 2\sin\theta = 2$ for $0° \leq \theta \leq 360°$

10(a) Find the radius and coordinates of the centre of the circle $x^2 + y^2 - 2x - 4y + 1 = 0$

(b) Find the length of the tangent from the point $(-2, 3)$ to the circle $x^2 + y^2 + 6x + 10y - 2 = 0$

11(a) Express $\frac{-4+2i}{3+i} + \frac{i}{4+6i}$ in modulus argument form.

12- Given that $x = \frac{t^2}{1+t^2}$ and $y = \frac{t^3}{1+t^2}$ find $\frac{dy}{dx}$.

13- Resolve $y = \frac{x^3+5x^2-6x+6}{(x-1)^2(x^2+2)}$ into partial fractions. Hence find $\frac{dy}{dx}$

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

Hence show that $\frac{1-\tan 15^\circ}{1+\tan 15^\circ} = \frac{1}{\sqrt{3}}$

(b) Given that $\cos A = 3/5$ and $\cos B = 12/13$ where A and B are acute; find the value of

(i) $\tan(A+B)$

(ii) $\csc(A+B)$