REVISED

Assignment-1
Applied Mathematics-II (BMAT0-201)
(UNIT-I)

1. (a) Show that the radius of curvature of a circle is constant.

   (b) Prove that for the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, the radius of curvature is $\frac{a^2b^2}{p^3}$, where p is the perpendicular from the center to the tangent at (x, y).

2. If ρ_1 and ρ_2 are the radii of curvatures at the extremities of two conjugate semi-diameters of an ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$, show that $\left(\rho_1^{\frac{2}{3}}+\rho_2^{\frac{2}{3}}\right)(ab)^{\frac{2}{3}}=a^2+b^2$.

3. Show that radius of curvature at the end of the major axis of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ is equal to the semi-latus rectum of the ellipse.

4. Show that radius of curvature at any point of the cardioid $r=a(1+\cos\theta)$ is $\frac{2}{3}\sqrt{2ar}$ and that $\frac{\rho^2}{r}$ is constant.

5. Trace the curve $x^3+y^3=3axy$.

6. Trace the curve $x=a(\theta+\sin\theta), y=a(1-\cos\theta)$.

7. Trace the curve $r=a(1+\cos\theta), a>0$.

8. Find the area enclosed by the curve $x(x^2+y^2)=a(x^2-y^2)$ and its asymptote.

9. Show that the area common to the Cardioid $r=a(1-\cos\theta)$ and $r=a(1+\cos\theta)$ is $\frac{a^2}{2}(3\pi-8)$.

10. Find the length of the arc of the parabola $y^2=4ax$ cut off by the line $3y=8x$.

11. Show that the length of an arc of the cycloid whose equations are $x=a(\theta-\sin\theta)$, $y=a(1-\cos\theta)$ is $8a$.

12. Find the perimeter of the cardioid $r=a(1-\cos\theta)$. Also show that the upper half of the curve is bisected by the line $\theta=\frac{2\pi}{3}$.

13. Find the volume generated by the revolution of the area under one complete arch of the cycloid $x=a(\theta-\sin\theta)$, $y=a(1-\cos\theta)$.
    The axis of revolution being (i) the $x-axis$ (ii) the $y-axis$.

14. Find the moment of inertia of a solid sphere about its diameter.

15. Find the moment of inertia of hollow right circular cone about its axis.