1. Find the length of the curve:
   (a) $x = 2t, y = 2t^{3/2}, 0 \leq t \leq 1$.
   (b) $r = \theta^2, 0 \leq \theta \leq \frac{\pi}{2}$.
   (c) $r = \cos^3(\theta/3), 0 \leq \theta \leq \frac{\pi}{2}$.
2. Find the area of the surface generated by revolving about $x$-axis of the curve $x = \cos^3 t, y = \sin^3 t, 0 \leq t \leq \frac{\pi}{2}$.
3. Sketch the graph and find the area of one leaf of:
   (a) $r = \sin 3\theta$.
   (b) $r^2 = \sin 2\theta$.
4. Find the area of the region:
   (a) Inside $r = \cos 2\theta$ and outside $r = 2 \cos 2\theta$.
   (b) Inside $r = 1$ and outside $r = 2 - 2 \cos \theta$.
5. Find equation of the following:
   (a) Parabola with focus $(2,1)$ and directrix $x = 0$.
   (b) Hyperbola with vertices $(0,2)$ and $(2,2)$ that passes through $(3,3)$.
6. Sketch the given conic and find foci, directrix, vertexes, asymptotes:
   (a) $x^2 + 4y^2 - 2x - 8y + 1 = 0$.
   (b) $9x^2 + 36x - 4y^2 - 24y - 36 = 0$.
7. Let $\vec{a} = 3\vec{i} + 2\vec{j} + \vec{k}, \vec{b} = \vec{i} + \vec{j} + \vec{k}$, and $\vec{c} = \vec{i} + 2\vec{j} + 3\vec{k}$. Find $\vec{a} \cdot \vec{b}, \vec{a} \times \vec{b}, \vec{a} \cdot (\vec{b} \times \vec{c})$.
8. Find the angle between vectors $\vec{a}$ and $\vec{b}$ as above.
9. Let $P = (0,1,0), Q = (1,2,3), R = (1,1,1)$. Find the area of the triangle $PQR$.
10. Find equation of the line that contains points $(1,2,3)$ and $(4,5,6)$.
11. Find angle between lines:
    \[
    \frac{x - 1}{1} = \frac{y - 2}{2} = \frac{z - 3}{3} \quad \text{and} \quad \frac{x - 1}{1} = \frac{y - 2}{1} = \frac{z - 3}{1}.
    \]
12. Find distance from the point $(1,1,1)$ to the line $\frac{x - 1}{1} = \frac{y - 2}{2} = \frac{z - 3}{3}$.
13. Find equation of the plane that contains points $(0,1,0), (1,2,3), (1,1,1)$.
14. Find distance from the point $(1,1,1)$ to the plane $2x + y + z + 1 = 0$.
15. Find equation of the line of intersection of the planes $2x + y + z + 1 = 0$ and $y + z - 5 = 0$. 