

List of Problems I

1. Find the parametric equations of the line of intersection of the planes $2x + y - z + 1 = 0$ and $x - y + 2z - 1 = 0$
2. Sketch the graph of $r = 3\cos\theta$
3. Find the parametric equations of the line whose vector equation is $\mathbf{i} + 2\mathbf{j} + 3\mathbf{k} = \mathbf{k} + t(\mathbf{i} - \mathbf{j} + \mathbf{k})$
4. Find the tangent line to the curve $x = \sqrt{t}$, $y = 2t - 1$ at the point $t = 1$
5. Find the point of intersection of the line $x = 2 + 2t$, $y = -1 - t$, $z = 4 + 2t$ and the plane $2x - 3y + 2z + 2 = 0$
6. Determine whether the vectors $\mathbf{u} = (2, 0, 2)$ and $\mathbf{v} = (1, 0, 0)$ are perpendicular, have same direction, have opposite directions or form some angle, in which case, find it.
7. Let $\|\mathbf{u}\| = 1$, $\|\mathbf{v}\| = 2$, and the angle between them is $\pi/6$. Find $\mathbf{u} \cdot \mathbf{v}$
8. Find the equation of the plane passing through the point $P(1, -1, 0)$ and normal to the vector $\mathbf{n}(1, 2, 3)$
9. Find the slope of the tangent line to the curve $r = 2\sin\theta$ at the point where $\theta = \pi/6$
10. Let $\mathbf{u} = (1, 1, 0)$ and $\mathbf{v} = (1, 0, -1)$. Find the direction cosines of $\mathbf{u} \times \mathbf{v}$
11. Find the terminal point of $\mathbf{v} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$ if the initial point is $(-1, 2, -1)$
12. Let $\mathbf{u} = \mathbf{i} + \mathbf{j} - \mathbf{k}$ and $\mathbf{v} = \mathbf{i} - 2\mathbf{j} + 2\mathbf{k}$. Find the unit vector in the direction of $\mathbf{u} + \mathbf{v}$.
13. Find the parametric equations of the line passing through $(-1, 4, 0)$ and parallel to the vector $\mathbf{i} + 2\mathbf{j} - \mathbf{k}$
14. Convert from rectangular to cylindrical $(4\sqrt{3}, 4, -4)$ and from rectangular to spherical
15. Convert from spherical to rectangular $(5, \pi/6, \pi/4)$