Tutorial 2: PHY101
(MONSOON 2023)

1. A particle moves along the curve $x = 2\sin 3t,\ y = 2\cos 3t,\ z = 8t$, where t is the time. Find the components of velocity and acceleration of the particle at $t = \pi/3$ in the direction $\hat{i} + \hat{j} + \hat{k}$.

2. Find the unit tangent vector to any point on the curve $x = 2t^2,\ y = t^2 - 4t,\ z = 3t - 5$. Determine the unit tangent at $t = 2$.

3) Find the projection of the vector **A** = i - 2j + k on the vector **B** = 4i - 4j + 7k

4) Find the area of the triangle having vertices at P(1, 3, 2), Q(2, -1, 1), R(-1, 2, 3).

5) Two vectors A and B have equal magnitudes of 10 units. Vector A makes an angle of 30 degrees with the positive x-axis, while vector B makes an angle of 45 degrees with the positive y-axis. Calculate the dot product and cross product of vectors A and B.

6) For what value of 'a' are $\vec{A} = a\hat{\imath} - 2\hat{\jmath} + \hat{k}$ and $\vec{B} = 2a\hat{\imath} + a\hat{\jmath} - 4\hat{k}$ perpendicular?