

# TRANSPORTA UN SAKARU INSTITUTS

EXERCISES OF

HIGHER MATHEMATICS I

VECTOR PRODUCTS

1. Find  $\mathbf{u} \cdot \mathbf{v}$

a)  $\mathbf{u} = (1, -5, 4), \mathbf{v} = (3, 3, 3)$       b)  $\mathbf{u} = (-2, 2, 3), \mathbf{v} = (1, 7, -4)$

2. Find the angle between  $\mathbf{u}$  and  $\mathbf{v}$

a)  $\mathbf{u} = (6, 1, 4), \mathbf{v} = (2, 0, -3)$       b)  $\mathbf{u} = (0, 0, -1), \mathbf{v} = (1, 1, 1)$   
c)  $\mathbf{u} = (-6, 0, 4), \mathbf{v} = (3, 1, 6)$       d)  $\mathbf{u} = (2, 4, -8), \mathbf{v} = (5, 3, 7)$

3. Find the orthogonal projection of  $\mathbf{u}$  on  $\mathbf{a}$

a)  $\mathbf{u} = (6, 2), \mathbf{a} = (3, -9)$       b)  $\mathbf{u} = (-1, -2), \mathbf{a} = (-2, 3)$   
c)  $\mathbf{u} = (3, 1, -7), \mathbf{a} = (1, 0, 5)$       d)  $\mathbf{u} = (1, 0, 0), \mathbf{a} = (4, 3, 8)$

4. Let  $\mathbf{u} = (3, 2, -1)$ ,  $\mathbf{v} = (0, 2, -3)$  and  $\mathbf{w} = (2, 6, 7)$ . Compute

a)  $\mathbf{v} \times \mathbf{w}$       b)  $\mathbf{u} \times (\mathbf{v} - 2\mathbf{w})$       c)  $(\mathbf{u} \times \mathbf{v}) - 2\mathbf{w}$   
d)  $\mathbf{u} \times (\mathbf{v} \times \mathbf{w})$       e)  $(\mathbf{u} \times \mathbf{v}) \times \mathbf{w}$       f)  $(\mathbf{u} \times \mathbf{v}) \times (\mathbf{v} \times \mathbf{w})$

5. Find the scalar triple product  $\mathbf{u} \cdot (\mathbf{v} \times \mathbf{w})$

a)  $\mathbf{u} = (-1, 2, 4), \mathbf{v} = (3, 4, -2), \mathbf{w} = (-1, 2, 5)$       b)  $\mathbf{u} = (3, -1, 6), \mathbf{v} = (2, 4, 3), \mathbf{w} = (5, -1, 2)$