Vectors Test (Practice)

[1] Let $\mathbf{u} = 2\mathbf{i} - \mathbf{j} + 4\mathbf{k}$ and $\mathbf{v} = \mathbf{i} + 3\mathbf{j} - \mathbf{k}$. Compute the following.

[a] $-2\mathbf{u} + 4\mathbf{v}$

[b] $\mathbf{u} \cdot \mathbf{v}$

[c] $|\mathbf{u}|$

[d] θ, the angle between **u** and **v**, to the nearest tenth of a degree

[e] $\mathbf{u} \times \mathbf{v}$

[f] the area of the triangle with sides $\mathbf{u}$ and $\mathbf{v}$.

[2] $\mathbf{a} = \mathbf{i} - \mathbf{j} + \mathbf{k}$, $\mathbf{b} = 2\mathbf{i} + \mathbf{j} + \mathbf{k}$, and $\mathbf{c} = \mathbf{i} + \mathbf{j} + 2\mathbf{k}$

Write the vector $\mathbf{i} - 2\mathbf{j} + 3\mathbf{k}$ .as a linear combination of **a**, **b**, and **c**.

[3] A line passes through the points (-1,3,4) and (2,2,6).
[a] Find a direction vector for the line.

[b] Write a vector equation for the line using *t* as the parameter.

[c] Write parametric equations for the line.

[d] Write the Cartesian equations for the line.

[4] The vector equation for line one is $\mathbf{r}(t) = \begin{pmatrix} 5 \\ -4 \\ 7 \end{pmatrix} + t \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix}$

The parametric equations for line two are $x = 5 + 4s,\ \ y = 4 + 2s,\ \ z = s$

[a] Find the intersection of lines one and two.

[b] Find the cosine of the acute angle between lines one and two.

[5] [a] State a vector that is normal to the *xy*-plane: ____
[b] Write a Cartesian equation for the plane that passes through the point (4,-2,2) and is parallel to the *xy*-plane.

[6] [a] State the direction vector of the line $\mathbf{r} = (\mathbf{i} + 2\mathbf{k}) + \lambda(3\mathbf{i} + \mathbf{j} - 4\mathbf{k})$ _____
[b] Write a Cartesian equation for the plane that passes through the point (4,-2,2) and is perpendicular to the line given by $\mathbf{r} = (\mathbf{i} + 2\mathbf{k}) + \lambda(3\mathbf{i} + \mathbf{j} - 4\mathbf{k})$

[7] [a] Write a Cartesian equation for the plane that passes through the point (4,-2,2) and is parallel to the vectors $\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $2\mathbf{i} + \mathbf{k}$

[b] Write a vector equation for the plane that passes through the point (4,-2,2) and is parallel to the vectors $\mathbf{i} + \mathbf{j} - \mathbf{k}$ and $2\mathbf{i} + \mathbf{k}$

[8] Write a Cartesian equation for the plane that passes through the points (3,2,1), (2,4,-1) and (9,1,-2)

[9] $\mathbf{u} = \frac{5}{9}\mathbf{i} - \frac{7}{15}\mathbf{j} + \frac{4}{7}\mathbf{k}$ and $\mathbf{v} = \frac{31}{32}\mathbf{i} + \frac{1}{43}\mathbf{j} - \frac{8}{5}\mathbf{k}$. What is the value of $\mathbf{u} \cdot (\mathbf{u} \times \mathbf{v})$?.