THEOREM 3 – $\|\vec{U} \times \vec{V}\|$ IS THE AREA OF THE PARALLELOGRAM DETERMINED BY $\vec{U}$ AND $\vec{V}$.

THE SCALAR TRIPLE PRODUCT OF $\vec{U}$, $\vec{V}$ AND $\vec{W}$ IS

$\vec{U} \cdot (\vec{V} \times \vec{W})$ WHICH EQUALS $\begin{vmatrix} U_1 & U_2 & U_3 \\ V_1 & V_2 & V_3 \\ W_1 & W_2 & W_3 \end{vmatrix}$

THEOREM 4 – a) THE ABSOLUTE VALUE OF $\det \begin{bmatrix} U_1 & U_2 \\ V_1 & V_2 \end{bmatrix}$ IS THE AREA OF THE PARALLELOGRAM DETERMINED BY (U_1, U_2) AND (V_1, V_2).

b) THE ABSOLUTE VALUE OF $\det \begin{bmatrix} U_1 & U_2 & U_3 \\ V_1 & V_2 & V_3 \\ W_1 & W_2 & W_3 \end{bmatrix}$ IS THE VOLUME OF THE PARALLELEPIPED DETERMINED BY (U_1, U_2, U_3), (V_1, V_2, V_3) AND (W_1, W_2, W_3).

THEOREM 5 – IF $\vec{U}$, $\vec{V}$ AND $\vec{W}$ HAVE THE SAME INITIAL POINT, THEN THEY LIE IN THE SAME PLANE $\Leftrightarrow$ $\begin{vmatrix} U_1 & U_2 & U_3 \\ V_1 & V_2 & V_3 \\ W_1 & W_2 & W_3 \end{vmatrix} = 0$

NOTE: SINCE $\vec{U} \times \vec{V}$ IS DETERMINED SOLELY BY GEOMETRIC PROPERTIES, IT IS INDEPENDENT OF THE CHOICE OF ORIGIN AND ORIENTATION OF RIGHT-HAND X-Y-Z AXIS SYSTEM.