where A is a unit-vector (say $A = \cos\lambda + \iota\sin\lambda$) and B, B′ are conjugate vectors. Or, writing $B = b + \iota\beta$, $B' = b - \iota\beta$, the constants are λ, b, β; 3 constants as it should be."

Quaternion Synopsis of Hertz' View of the Electrodynamical Equations.

By Professor TAIT.

Note on Menelaus's Theorem.

By R. E. ALLARDICE, M.A.

§ 1. The object of this note is, in the first place, to show that Menelaus's Theorem, regarding the segments into which the sides of a triangle are divided by any transversal, is a particular form of the condition, in trilinear co-ordinates, for the collinearity of three points; and, in the second place, to point out an analogue of Menelaus's Theorem in space of three dimensions.

§ 2. In the usual system of areal co-ordinates, the x-co-ordinate of P (fig. 52) is $\Delta PBC/\Delta ABC$, that is PD/AD. Now let D, E, F, be three points in BC, CA, AB, respectively, dividing these sides in the ratios l_1/m_1, l_2/m_2, l_3/m_3; then the co-ordinates of D, E, F, are proportional to $(0, m_1, l_1)$, $(l_2, 0, m_2)$, $(m_3, l_3, 0)$. Hence the condition that D, E, F, lie on the straight line $Ax + By + Cz = 0$ is

$$\begin{vmatrix} 0 & m_1 & l_1 \\ l_2 & 0 & m_2 \\ m_3 & l_3 & 0 \end{vmatrix} = 0,$$

that is, $l_1 l_2 l_3 + m_1 m_2 m_3 = 0$, which is Menelaus's Theorem.

§ 3. In space of three dimensions we may use the corresponding system of tetrahedral co-ordinates, and obtain a theorem analogous to that of Menelaus.

Let BCD (fig. 53) be one of the faces of the tetrahedron; and put $a_2 = PB'/BB' = \Delta PCD/BCD$, $a_3 = PC'/CC' = \Delta PDB/\Delta CDB$, etc. Then the co-ordinates of P, Q, R, S, points in the four faces of the tetrahedron, may be written $(0, a_2, a_3, a_4)$, $(b_1, 0, b_3, b_4)$, etc.; and the condition that these four points be coplanar is

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