On the Foundations of Dynamics.

By Dr PEDDIE.

Note on a Theorem in connection with the Hessian of a Binary Quantic.

By CHARLES TWEEDIE, M.A., B.Sc.

Extension of the "Medial Section" problem (Euclid II:11, VI:30, etc.) and derivation of a Hyperbolic Graph.

By R. E. ANDERSON, M.A.

To divide the straight line AB (containing a units) at C so that

$$AB \,.\, BC = p \,.\, AC^2.$$

§ I.

By algebra, taking the positive root,

$$AC = \frac{AB}{2p}(\sqrt{4p+1} - 1), \qquad . \quad . \quad . \quad (1.)$$

The number p may therefore have any positive value, integral or fractional, and when negative cannot exceed $\frac{1}{4}$. Secondly, AC and AB are incommensurable except when $4p+1$ is a square :— *e.g.*, if $4p = (q-1)(q+1)$ or if $p = q(q+1)$, q being any positive integer or fraction.

To find the surd-line $\sqrt{4p+1}$ geometrically is the heart of the problem. *Euclid* solves it (II:11) when $p=1$ by I : 47, which is also used in Ex. i., ii., iii. following; but II:14 will sometimes be easier. Since equation (1.) becomes $AC = \sqrt{4p+1} - 1$, if $AB = 2p$, *i.e.*, if the unit line is $\dfrac{AB}{2p}$ or $\dfrac{AM}{p}$ *, we construct thus:—

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