

asymptotes there touch the multiple line ; finally, every one of the n generators is cut by the same asymptotic line in but one point not on the directrix; the whole order is

$$2m(n-1) + 2(m-n) + n - 2\delta = 2mn - n - 2\delta.$$

In particular, if the surface is unicursal, the order reduces to $2m + n - 2$.

For the surface $\overline{[2, 2]}$ without double line (Cayley, IV) the order is 6, with a double line (Cayley, V) the order is 4. For these surfaces the multiple line cannot be a generator.

The surface $\overline{[3, 1]}$ (Cayley, VI) is unicursal ; its asymptotic lines are of order 5. The triple line is double generator.

For the cubic $\overline{[2, 1]}$ (Cayley's cubic scroll) the order is 3 ; the double directrix counts as single generator.

CORNELL UNIVERSITY,
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WILLSON'S GRAPHICS.

Theoretical and Practical Graphics. By F. N. WILLSON, C.E., M.A., Professor of Graphics, Princeton University. New York, The Macmillan Company, 1898. 4to, 300 pp. Price, \$4.00.

This work, primarily, is a text book on graphics compiled by an experienced teacher to meet the needs of his own classes. Few student have, heretofore, been called upon to make larger expenditures for books than has the embryo engineer and in combining, under the comprehensive title of graphics, much that is essential for such students, for example, chapters upon freehand and mechanical drawing, theory of the helix, link motion, trochoidal and other mechanical curves and the theory of descriptive geometry, a real need has been recognized. This volume is far more than a collection of class room notes. Every page bears evidence of conscientious care and research. The grouping of the chapters, the concise and useful table of contents, the clear cut and often elaborate illustrations and the exceptional typographical excellence cannot be too highly commended.