cones projecting C and C' from (0, 0, 1, 0) have contact of at least order $n+1$. Moreover, by changing this vertex to the point $(a, b, 1, 0)$ it is easily shown by a method similar to that used in the general case that the cones projecting C and C' from any point in the osculating plane have contact of order $n+1$. In other words, this special case arises when the principal plane coincides with the osculating plane.

THE UNIVERSITY OF KANSAS

ON RECTIFIABILITY IN METRIC SPACES

BY W. A. WILSON

1. *Introduction.* In Menger's studies in metrical geometry* considerable attention is given to the rectification of the simple arc and various definitions of the length of such an arc are discussed. With the definition of arc-length it is then possible to give conditions for the "Konvexifizierbarkeit" of a compact metric space (p. 96) and for the existence of a geodetic arc in a compact metric space (p. 492). Both theorems involve the assumption of the existence of a rectifiable arc between each pair of points. It is intended in this paper to show that these results and some others are due to space properties which are of a more general nature, at least formally, and which suggest possible further studies.

2. *Intrinsic Distance.* If a and b are two points of a metric space Z, we let ab denote the distance between them. A finite set of points $\{a_i\}$ such that $a_0=a$, $a_n=b$, and every $a_ia_{i+1}<\delta$ will be called a δ-chain from a to b, and $aa_1+a_1a_2+\cdots+a_{n-1}b$ will be called its length. If we set $l_\delta(a, b)$ equal to the lower bound of the lengths of all δ-chains from a to b, it is clear that this number exists if there is any such chain, that it is greater than or equal to ab, and that it increases monotonely as $\delta\to 0$. The upper bound of $l_\delta(a, b)$ for all values of δ is called the *intrinsic distance*† from a to b and is denoted by $l(a, b)$.

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* *Untersuchungen über allgemeine Metrik,* Mathematische Annalen, vol. 100, pp. 75–163 and vol. 103, pp. 466–501. See also Annals of Mathematics, vol. 32, pp. 739–746.

† This turns out to be essentially the same thing as Menger's "*geodetic distance,*" loc. cit., p. 492. See §§4 and 7 below.