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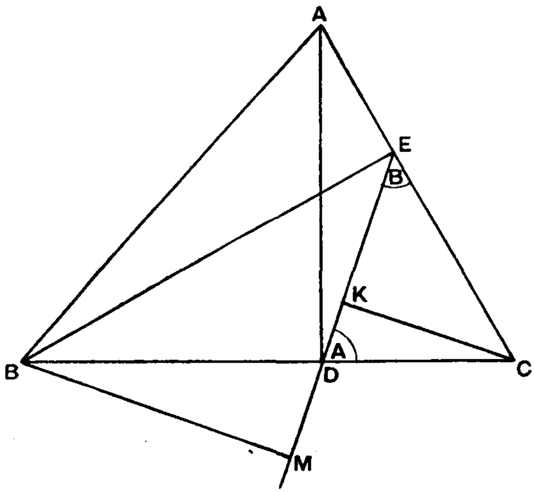
Geometrical Proof of tan A + tan B + tan C = tan A tan B tan C.—Let ABC be the $\triangle$, AD and BE $\perp$s to BC and AC, CK and BM $\perp$s to ED.



Then $\angle CED = B$, and $\angle CDE = A$. Let R = radius of circum-circle of $\triangle ABC$.

$$EK = CE \cos B = BC \cos C \cos B = 2R \sin A \cos C \cos B.$$

$$KD = CD \cos A = AC \cos C \cos A = 2R \sin B \cos C \cos A.$$

$$DM = BD \cos A = AB \cos B \cos A = 2R \sin C \cos B \cos A.$$

$$EM = BE \sin B = AB \sin A \sin B = 2R \sin C \sin A \sin B.$$

Now $EM = EK + KD + DM$.

$\therefore$ $2R \sin A \sin B \sin C =$

$$2R \sin A \cos B \cos C + 2R \sin B \cos A \cos C + 2R \sin C \cos A \cos B,$$

Divide throughout by $2R\cos A\cos B\cos C$,

$$\therefore\quad \tan A+\tan B+\tan C=\tan A\tan B\tan C,$$

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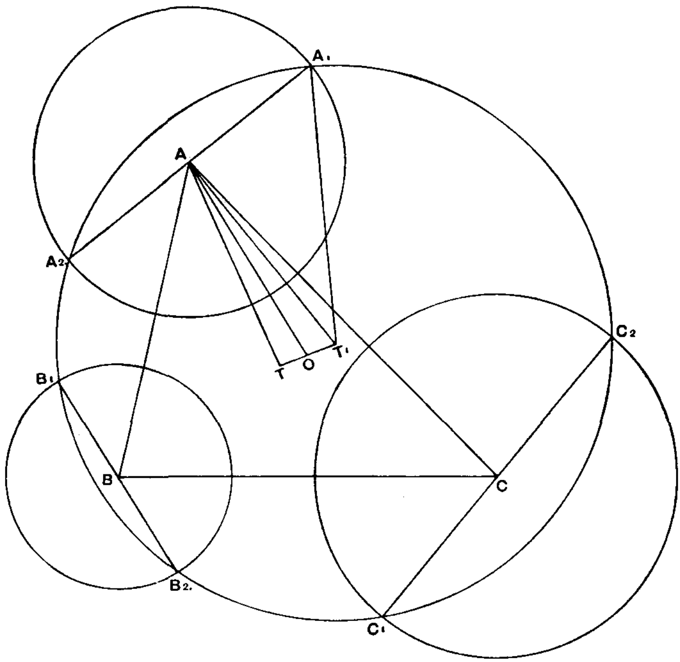
To draw a circle which cuts three circles at the ends of the diameters of these circles.—Let the three circles have centres, A, B, C, and let their radical centre be T, and the



circumcentre of $\triangle ABC$ be O. Join TO and produce it to T_1, so that $T_1O=TO$. T_1 is the centre of the required circle. Join T_1A and T_1C, and draw diameters A_1AA_2, and C_1CC_2 perpendicular to T_1A and T_1C. ⊙ with centre T_1 and radius T_1A_2 passes through A_1.