Week 24: Problems

(properties of triangles)

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1. a, b, A are given. Let c_1 and c_2 be two possible values of the third side. Then prove that $(c_1 - c_2)^2 + (c_1 + c_2)^2 \tan^2 A = 4a^2$
2. If $r_a = r_b + r_c + r$, then the triangle is right-angled.
3. Prove that $\cos A + \cos B + \cos C = 1 + \frac{r}{R}$. Prove that $\cos A + \cos B + \cos C \leq \frac{3}{2}$ using the previous result or otherwise.
4. A semicircle is inscribed in a triangle so that sides AB and AC are tangential to the semicircle and centre of the circle lies on the line segment BC. Prove that radius of the circle is $\frac{2\Delta}{b+c}$
5. Product of the distances from the incentre to the vertices of a triangle is $4Rr^2$
