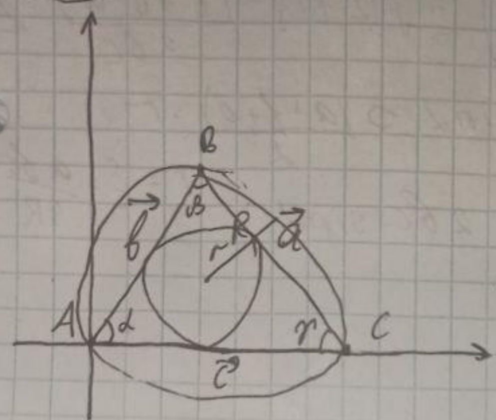
(3.1.20)



$\measuredangle \triangle ABC$

$] \ \vec{BC} = \vec{a}, \ \vec{AB} = \vec{b}, \ \vec{AC} = \vec{c}$

$\vec{AB} = \vec{b} = b(\cos\beta + \sin\beta)$

$\vec{AC} = \vec{c} = c(\cos\gamma + \sin\gamma)$

$\vec{a} = \vec{c} - \vec{b} = c(\cos\gamma + \sin\gamma) - b(\cos\beta + \sin\beta) =$
$= (c\cos\gamma - b\cos\beta) + (c\sin\gamma - b\sin\beta)$

$a^2 = (c\cos\gamma - b\cos\beta)^2 + (c\sin\gamma - b\sin\beta)^2 =$
$= c^2\cos^2\gamma - 2bc\cos\gamma\cdot\cos\beta + b^2\cos^2\beta + c^2\sin^2\gamma -$
$2bc\sin\gamma\sin\beta + b^2\sin^2\beta = c^2(1-\sin^2\gamma) - 2bc\cos\gamma\cdot$
$\cdot\cos\beta + b^2(1-\sin^2\beta) + c^2\sin^2\gamma - 2bc\sin\gamma\sin\beta +$
$+ b^2\sin^2\beta = c^2 - \cancel{c^2\sin^2\gamma} - 2bc\cos\gamma\cos\beta + b^2 - \cancel{b^2\sin^2\beta}$
$+ \cancel{c^2\sin^2\gamma} - 2bc\sin\gamma\sin\beta + \cancel{b^2\sin^2\beta} = b^2 + c^2 - 2bc\cos\gamma$
$\cos\beta - 2bc\sin\gamma\sin\beta = b^2 + c^2 - 2bc(\cos\gamma\cos\beta +$
$+ \sin\gamma\sin\beta) = b^2 + c^2 - 2bc\cos(\gamma - \beta) =$
$= b^2 + c^2 - 2bc\cos(\alpha) \Rightarrow \cos\alpha = \dfrac{(b^2 + c^2 - a^2)}{2bc}$

Т.к. $\sin\alpha = \sqrt{1-\cos^2\alpha} \Rightarrow$ след. стран.

$$\sin\alpha = \sqrt{\left(1-\left(\frac{b^2+c^2-a^2}{2b^2c^2}\right)^2\right)} = \frac{\sqrt{(2\cdot bc)^2-(b^2+c^2-a^2)^2}}{2bc}\ \cancel{c}$$

$$S = p\cdot r = \frac{1}{2}\cdot b\cdot c\cdot \sin\alpha = \frac{(a+b+c)}{2}\cdot r$$

$$r = \frac{S}{p} = \frac{abc}{4R}$$

$$\sqrt{4b^2c^2-(b^2+c^2-a^2)^2} = 2bc\cdot\sin\alpha$$