

Task 1. If $a \cos x = b$ and x is acute, prove $\frac{\sin^2 x}{1 - \cos x} = \frac{a+b}{a}$.

Solution. Since x is acute, then $\cos x \neq 1$, so we have

$$\frac{\sin^2 x}{1 - \cos x} = \frac{1 - \cos^2 x}{1 - \cos x} = \frac{(1 - \cos x)(1 + \cos x)}{1 - \cos x} = 1 + \cos x.$$

Therefore,

$$a \frac{\sin^2 x}{1 - \cos x} = a + a \cos x = a + b.$$

This implies $\frac{\sin^2 x}{1 - \cos x} = \frac{a+b}{a}$, if $a \neq 0$. □