Question

If $\tan a = b/a$, prove that $a \cos 2a + b \sin 2a = a$.

Proof

It follows from $\tan a = b/a$ that $\cos a = \dfrac{a}{b} \sin a$.

Substituting the previous formula into

$a \cos 2a + b \sin 2a = a(\cos^2 a - \sin^2 a) + b \cdot 2 \sin a \cos a =$
$= a(\cos^2 a - \sin^2 a) + b \cdot 2 \sin a \cdot \dfrac{a}{b} \sin a = a(\cos^2 a - \sin^2 a) + 2a\sin^2 a =$
$= a(\cos^2 a + \sin^2 a) = a$
QED