Compound angle formulae

$\sin(A + B) = \sin A \cos B + \cos A \sin B$

$\sin(A - B) = \sin A \cos B - \cos A \sin B$

$\cos(A + B) = \cos A \cos B - \sin A \sin B$

$\cos(A - B) = \cos A \cos B + \sin A \sin B$

$\tan(A + B) = \dfrac{\tan A + \tan B}{1 - \tan A \tan B}; \tan(A - B) = \dfrac{\tan A - \tan B}{1 + \tan A \tan B}$

Example 3

Prove that $\dfrac{\sin(A + B)}{\cos A \cos B} = \tan A + \tan B.$

$\sin(A+B) = \sin A \cos B + \cos A \sin B$

$\tan A = \dfrac{\sin A}{\sin B}$

$LHS = \dfrac{\sin A \cos B + \cos A \sin B}{\cos A \cos B}$

$= \dfrac{\sin A \cos B}{\cos A \cos B} + \dfrac{\cos A \sin B}{\cos A \cos B}$

$= \tan A + \tan B$