

Derive ⑨ $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$

we know that

$$\textcircled{7} \quad \sin(A+B) = \sin A \cos B + \cos A \sin B$$

$$\textcircled{5} \quad \cos(A+B) = \cos A \cos B - \sin A \sin B$$

and $\tan A = \frac{\sin A}{\cos A}$

$$\tan(A+B) = \frac{\sin(A+B)}{\cos(A+B)} = \frac{\sin A \cos B + \cos A \sin B}{\cos A \cos B - \sin A \sin B}$$

$$\begin{aligned} & \left[\begin{array}{l} \text{Divide each part} \\ \text{by } \cos A \cos B \end{array} \right] \\ & = \frac{\frac{\sin A \cos B}{\cos A \cos B} + \frac{\cos A \sin B}{\cos A \cos B}}{\frac{\cos A \cos B}{\cos A \cos B} - \frac{\sin A \sin B}{\cos A \cos B}} = \frac{\tan A + \tan B}{1 - \tan A \tan B} \end{aligned}$$