2 **(a)** It is given that $\tan(A+B)=8$ and $\tan B=2$. **Without using a calculator**, find the exact value of $\cot A$. [3]

(b) **(i)** Prove that $\sin 2x(\cot x-\tan x)=2\cos 2x$. [3]

(ii) Hence solve the equation $\sin 2x(\cot x - \tan x) = \sec 2x$ for $0 \le x \le \pi$.

[4]

2 **(a)** It is given that $\tan(A+B)=8$ and $\tan B=2$. **Without using a calculator**, find the exact value of $\cot A$. [3]

$$\tan(A+B)=\frac{\tan A+\tan B}{1-\tan A\tan B}$$ Addition Formula

Given $\tan(A+B)=8$, $\tan B=2$ substitute

$$8=\frac{\tan A+2}{1-2\tan A}$$

$$17\tan A=6$$

$$\tan A=\frac{6}{17}$$

$$\cot A=\frac{17}{6}$$ Ans

(b) **(i)** Prove that $\sin 2x(\cot x-\tan x)=2\cos 2x$. [3]

$$LHS=\sin 2x(\cot x-\tan x)$$

$$=2\sin x\cos x\left(\frac{\cos x}{\sin x}-\frac{\sin x}{\cos x}\right)$$

$$=2(\cos^2 x-\sin^2 x)$$

$$=2\cos 2x=RHS \text{ (proven)}$$ Ans

(ii) Hence solve the equation $\sin 2x(\cot x - \tan x) = \sec 2x$ for $0 \le x \le \pi$.

[4]

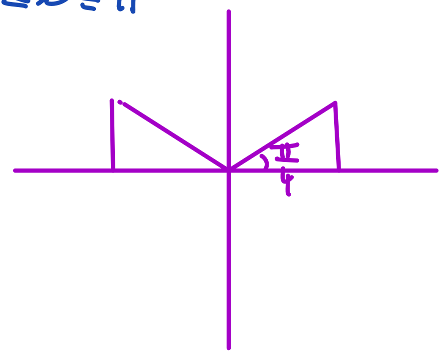
$\sin 2x(\cot x - \tan x) = \sec 2x$

$2\cos 2x = \sec 2x$

$2\cos 2x = \dfrac{1}{\cos 2x}$

$2(\cos 2x)^2 = 1$

$\therefore \cos 2x = \pm \dfrac{1}{2}$ $\quad 0 \le x \le \pi$



Ref $\angle = \dfrac{\pi}{4}$ rad

$2x = \dfrac{\pi}{4}, \dfrac{3\pi}{4}, \dfrac{5\pi}{4}, \dfrac{7\pi}{4}$

$\therefore x = \dfrac{\pi}{8}, \dfrac{3\pi}{8}, \dfrac{5\pi}{8}$ and $\dfrac{7\pi}{8}$ // Ans