Tips and Tricks

1. Use Pythagorean Identities to transform between $\sin^2 x$ and $\cos^2 x$

Pay special attention to addition of squared trigonometry terms.
Apply the Pythagorean identities when necessary. Especially $\sin^2 x+\cos^2 x=1$ since all the other trigo terms have been converted into sine and cosine. This identity can be used to convert into and vice versa. It can also be used to remove both by turning it into 1.

Example Q4) Prove that $\frac{1}{\sin x+1}-\frac{1}{\sin x-1}=\frac{2}{\cos^2 x}$

$$LHS=\frac{1}{\sin x+1}-\frac{1}{\sin x-1}$$

$$=\frac{\sin x-1}{(\sin x+1)(\sin x-1)}-\frac{\sin x+1}{(\sin x+1)(\sin x-1)}$$

$$=\frac{\sin x-1-\sin x-1}{(\sin x+1)(\sin x-1)}$$

$$=\frac{-2}{\sin^2 x-1}$$

$$=\frac{2}{1-\sin^2 x}$$

$$=\frac{2}{\cos^2 x}=RHS\ (Proved)$$

(Using Pythagorean identity to transform $\sin^2 x$ into $\cos^2 x$)

2. Know when to Apply Double Angle Formula (DAF)

Observe every trigonometric term in the question. Are there terms with angles that are 2 times of another? If there are, be ready to use DAF to transform them into the same angle. For example, if you see sinθ and cot(θ/2) in the same question, you have to use DAF since θ is 2 times of (θ/2).

Example Q5) Prove the identity $\frac{2\cos\theta-\sec\theta}{2\sin\theta}=\cot 2\theta$

Approach: Since RHS angle is 2θ and LHS has terms with angle θ, DAF has to be used.

$$LHS=\frac{2\cos\theta-\sec\theta}{2\sin\theta}$$

$$=\frac{2\cos\theta-\frac{1}{\cos\theta}}{2\sin\theta}$$

$$=\frac{2\cos^2\theta-1}{2\sin\theta\cos\theta}$$

$$=\frac{\cos 2\theta}{\sin 2\theta}$$

(Apply DAF)

$$=\cot 2\theta=RHS\ (Proven)$$