Fri 3/13

1. $\sin\theta\cot\theta + \cos\theta\tan\theta$

$= \sin\theta \cdot \frac{\cos\theta}{\sin\theta} + \cos\theta \cdot \frac{\sin\theta}{\cos\theta}$

$= \boxed{\cos\theta + \sin\theta}$

(This does not $= 1$ because they are not squared)

2. $\tan\theta\cot\theta - \cos^2\theta\tan^2\theta$

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

$= 1 - \sin^2\theta$

$= \boxed{\cos^2\theta}$

3. $\sin x \cos x (\tan x + \cot x)$

$= \sin x \cos x \tan x + \sin x \cos x \cot x$

$= \sin x \cos x \cdot \frac{\sin x}{\cos x} + \sin x \cos x \frac{\cos x}{\sin x}$

$= \sin^2 x + \cos^2 x$

$= \boxed{1}$

OR

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

$= \sin^2 x + \cos^2 x$

$= \boxed{1}$

4. $\sin\alpha\csc\alpha + \cos\alpha\csc\alpha\cot\alpha$

$= \sin\alpha \cdot \frac{1}{\sin\alpha} + \cos\alpha \cdot \frac{1}{\sin\alpha} \cdot \frac{\cos\alpha}{\sin\alpha}$

$= 1 + \frac{\cos^2\alpha}{\sin^2\alpha}$

$= 1 + \cot^2\alpha$

$= \boxed{\csc^2\alpha}$

$\longrightarrow = \csc\alpha(\sin\alpha + \cos\alpha\cot\alpha)$

OR $= \csc\alpha\left(\sin\alpha \cdot \frac{\sin\alpha}{\sin\alpha} + \cos\alpha \cdot \frac{\cos\alpha}{\sin\alpha}\right)$

$= \csc\alpha\left(\frac{\sin^2\alpha + \cos^2\alpha}{\sin\alpha}\right)$

$= \csc\alpha\left(\frac{1}{\sin\alpha}\right)$

$= \csc\alpha \cdot \csc\alpha = \boxed{\csc^2\alpha}$

5. $\sin^2\theta + \sin^2\theta\tan^2\theta$

$= \sin^2\theta(1 + \tan^2\theta)$

$= \sin^2\theta(\sec^2\theta)$

$= \sin^2\theta \cdot \frac{1}{\cos^2\theta} = \frac{\sin^2\theta}{\cos^2\theta} = \boxed{\tan^2\theta}$

OR

$= \sin^2\theta + \sin^2\theta \cdot \frac{\sin^2\theta}{\cos^2\theta}$

$= \frac{\cos^2\theta}{\cos^2\theta}\sin^2\theta + \frac{\sin^4\theta}{\cos^2\theta}$

$= \frac{\sin^2\theta\cos^2\theta + \sin^4\theta}{\cos^2\theta}$

$= \frac{\sin^2\theta(\cos^2\theta + \sin^2\theta)}{\cos^2\theta}$

$= \frac{\sin^2\theta}{\cos^2\theta} = \boxed{\tan^2\theta}$

6. $\cot x\csc^2 x - \cot x$

$= \cot x(\csc^2 x - 1) = \cot x \cdot \cot^2 x = \boxed{\cot^3 x}$

OR

$= \frac{\cos x}{\sin x}\left(\frac{1}{\sin^2 x}\right) - \frac{\cos x}{\sin x} \cdot \frac{\sin^2 x}{\sin^2 x}$

$= \frac{\cos x - \cos x\sin^2 x}{\sin^3 x} = \frac{\cos x(1 - \sin^2 x)}{\sin^3 x}$

$= \frac{\cos x \cdot \cos^2 x}{\sin^3 x} = \frac{\cos^3 x}{\sin^3 x} = \boxed{\cot^3 x}$

7. $\sec x - \sin x \tan x$

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

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

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

$= \frac{\cos^2 x}{\cos x} = \boxed{\cos x}$

8. $\cot\alpha(\tan\alpha - \cot\alpha \sin^2\alpha)$

$\cot\alpha \tan\alpha - \cot^2\alpha \sin^2\alpha$

$\frac{1}{\tan\alpha} \cdot \tan\alpha - \frac{\cos^2\alpha}{\sin^2\alpha} \cdot \sin^2\alpha$

$1 - \cos^2\alpha$

$\boxed{\sin^2\alpha}$

9. $\sin\theta \sec\theta \cot\theta + \cos\theta \csc\theta \tan\theta$

$= \sin\theta \cdot \frac{1}{\cos\theta} \cdot \frac{\cos\theta}{\sin\theta} + \cos\theta \cdot \frac{1}{\sin\theta} \cdot \frac{\sin\theta}{\cos\theta}$

$= 1 + 1$

$= \boxed{2}$