

D.2 Notes (5.2 in bk): Verifying Trig Identities

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

only change this side

$$\frac{\cot^2 x}{\csc^2 x} \rightarrow \frac{\cos^2 x}{\sin^2 x} \rightarrow \frac{1}{\sin^2 x}$$

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

$\cos^2 x = \cos^2 x \checkmark$

$$\begin{array}{l} \cancel{+} \cot^2 x = \csc^2 \\ \cancel{-} 1 \end{array} \quad \begin{array}{l} \csc^2 \\ -1 \end{array}$$

$\cot^2 x = \csc^2 x - 1$

② $2 \csc x = \frac{1}{\csc x + \cot x} + \frac{1}{\csc x - \cot x}$ *need common den.

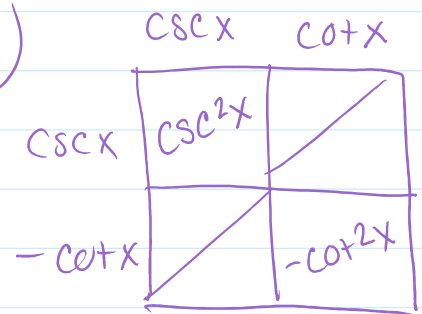
$$\left(\frac{\csc x - \cot x}{\csc x - \cot x} \right)$$

$$\left(\frac{\csc x + \cot x}{\csc x + \cot x} \right)$$

$$\frac{\csc x - \cancel{\cot x} + \csc x + \cancel{\cot x}}{\csc^2 x - \cancel{\cot^2 x}}$$

$$\frac{2 \csc x}{\csc^2 x - (\csc^2 x - 1)}$$

$$\frac{2 \csc x}{\cancel{\csc^2 x} - \cancel{\csc^2 x} + 1}$$



$$\begin{array}{l} \cancel{+} \cot^2 x = \csc^2 x \\ \cancel{-} 1 \end{array} \quad \begin{array}{l} \csc^2 x \\ -1 \end{array}$$

$\cot^2 x = \csc^2 x - 1$

$$\frac{2 \csc x}{1} \downarrow$$

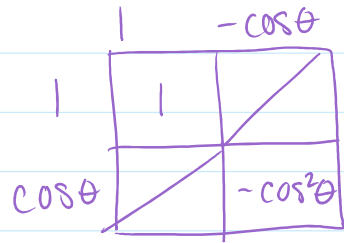
$$2 \csc x = 2 \csc x \quad \checkmark$$

③ $\frac{\sin \theta}{1 - \cos \theta} = \csc \theta + \cot \theta$

* multiply by the conjugate

$$\left(\frac{1 + \cos \theta}{1 + \cos \theta} \right) \downarrow$$

$$\frac{\sin \theta (1 + \cos \theta)}{1 - \cos^2 \theta}$$



$$\downarrow$$

$$\frac{\sin \theta (1 + \cos \theta)}{\sin^2 \theta}$$

$$\sin^2 \theta + \cancel{\cos^2 \theta} = 1$$

$$\quad \quad \quad -\cos^2 \theta \quad -\cos^2 \theta$$

$$\sin^2 \theta = 1 - \cos^2 \theta$$

$$\downarrow$$

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

$$\downarrow$$

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

} separate fraction

$$\downarrow$$

$$\csc \theta + \cot \theta = \csc \theta + \cot \theta \quad \checkmark$$

Homework: pg. 324 2-12 (even)