

$$1.) \frac{\tan t \cos t - \frac{\sin t}{\tan t}}{\frac{\sin t}{\cos t} \cdot \cos t - \frac{\sin t}{1} \cdot \frac{\sin t}{\cos t}}$$

$$\frac{\sin t - \frac{\sin t}{1} \cdot \frac{\cos t}{\sin t}}{\frac{\sin t}{\cos t} - \frac{\sin t}{\cos t}}$$

$$\boxed{\sin t - \cos t}$$

$$2.) 2 \cos t (3 - 7 \tan t)$$

$$6 \cos t - 14 \cos t \tan t$$

$$6 \cos t - 14 \frac{\cos t \cdot \sin t}{\cos t}$$

$$\boxed{6 \cos t - 14 \sin t}$$

$$5.) \frac{\sin 2\alpha}{\cos \alpha}$$

$$\frac{2 \sin \alpha \cos \alpha}{\cos \alpha}$$

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

$$6.) \frac{\cos^2 \theta - 1}{\sin \theta} \left\{ \begin{array}{l} \cos^2 \theta + \sin^2 \theta = 1 \\ \cos^2 \theta = 1 - \sin^2 \theta \end{array} \right.$$

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

$$\frac{-\sin^2 \theta}{\sin \theta}$$

$$\boxed{-\sin \theta}$$

$$7.) \frac{\cos 2t}{\cos t + \sin t}$$

$$\frac{\cos^2 t - \sin^2 t}{\cos t + \sin t} \leftarrow \text{Difference of Two Squares}$$

$$\frac{(\cos t + \sin t)(\cos t - \sin t)}{\cos t + \sin t}$$

$$\boxed{\cos t - \sin t}$$

$$8.) \frac{1}{1 - \sin \theta} + \frac{1}{1 + \sin \theta}$$

$$\frac{1}{1 - \sin \theta} \left( \frac{1 + \sin \theta}{1 + \sin \theta} \right) + \frac{1}{1 + \sin \theta} \left( \frac{1 - \sin \theta}{1 - \sin \theta} \right)$$

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

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

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

$$10.) \frac{1}{\sin t \cos t} - \frac{1}{\tan t}$$

$$\frac{1}{\sin t \cos t} - \frac{1}{\frac{\sin t}{\cos t}}$$

$$\frac{1}{\sin t \cos t} - \frac{\cos t}{\sin t} \cdot \left( \frac{\cos t}{\cos t} \right)$$

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

$$\boxed{= \tan t}$$

$$12.) \frac{2 \sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)}$$

$$\boxed{2 \tan\left(\frac{x}{2}\right)}$$

17.)  $\sin \theta$  in terms of  $\cos \theta$

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

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

$$\boxed{\sin \theta = \pm \sqrt{1 - \cos^2 \theta}}$$

23.)  $\frac{\sin t}{1 - \cos t} = \frac{1 + \cos t}{\sin t}$

$$\frac{\sin t}{1 - \cos t} \cdot \frac{1 + \cos t}{1 + \cos t}$$

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

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

$$\frac{1 + \cos t}{\sin t} \checkmark$$

26.)  $\sin^2 \theta - \cos^2 \theta = \sin \theta$

$$\sin^2 \theta - (1 - \sin^2 \theta) = \sin \theta$$

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

$$2 \sin^2 \theta - \sin \theta - 1 = 0$$

$$(2 \sin \theta + 1)(\sin \theta - 1) = 0$$

$$2 \sin \theta + 1 = 0 \quad \sin \theta - 1 = 0$$

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

$$\theta = \sin^{-1}\left(-\frac{1}{2}\right) \quad \theta = \sin^{-1}(1)$$

$$\boxed{\theta = \frac{7\pi}{6}, \frac{11\pi}{6} \quad \theta = \frac{\pi}{2}}$$

27.)  $\sin(2\theta) - \cos \theta = 0$

$$2 \sin \theta \cos \theta - \cos \theta = 0$$

$$\cos \theta (2 \sin \theta - 1) = 0$$

$$\cos \theta = 0 \quad 2 \sin \theta - 1 = 0$$

$$\boxed{\theta = \frac{\pi}{2}, \frac{3\pi}{2}} \quad \sin \theta = \frac{1}{2}$$

$$\boxed{\theta = \frac{\pi}{6}, \frac{5\pi}{6}}$$

28.)  $\sec^2 \theta = 1 - \tan \theta$

$$\tan^2 \theta + 1 = 1 - \tan \theta$$

$$\tan^2 \theta + \tan \theta = 0$$

$$\tan(\tan \theta + 1) = 0$$

$$\tan \theta = 0 \quad \tan \theta + 1 = 0$$

$$\boxed{\theta = 0, \pi, 2\pi} \quad \tan \theta = -1$$

(When  $\sin \theta = 0$ )  $\boxed{\theta = \frac{3\pi}{4}, \frac{7\pi}{4}}$

(Q2, Q4)

\*29.)  $\tan(2\theta) + \tan \theta = 0$

$$\frac{2 \tan \theta}{1 - \tan^2 \theta} + \tan \theta = 0$$

$$\tan \theta \left( \frac{2}{1 - \tan^2 \theta} + 1 \right) = 0$$

$$\tan \theta = 0 \quad \frac{2}{1 - \tan^2 \theta} + 1 = 0$$

$$\boxed{\theta = 0, \pi, 2\pi} \quad \frac{2}{1 - \tan^2 \theta} = -1$$

$$-1 + \tan^2 \theta = 2$$

$$\tan^2 \theta = 3$$

$$\tan \theta = \pm \sqrt{3}$$

$$\boxed{\theta = \frac{\pi}{3}, \frac{4\pi}{3}, \frac{2\pi}{3}, \frac{5\pi}{3}}$$

32.)  $\sin\left(\frac{1}{x}\right) = \frac{1}{\sin x}$

**NOT AN IDENTITY**  
 {not the same graph}  
 $\boxed{x = \text{any } \#}$   
 $\uparrow$   
 FALSE AT...

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

Same Graph  
 $\checkmark$  - Identity -

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

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

$$\frac{-\cos^2 \theta}{\cos \theta} = -\cos \theta \checkmark$$

Same Graph - Identity  
 $\downarrow$

41.)  $\sin x \tan x = \frac{1 - \cos x}{\cos x}$

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

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