

$$68. \sin 3x + \sin x = 4 \sin x - 4 \sin^3 x$$

$$\begin{aligned}
 \text{LHS} &= \sin(x+2x) + \sin x = \\
 &= \sin x \cos 2x + \cos x \sin 2x + \sin x = \\
 &= \sin x (\cos^2 x - \sin^2 x) + \cos x (2 \sin x \cos x) + \sin x = \\
 &= \sin x \cos^2 x - \sin^3 x + 2 \sin x \cos^2 x + \sin x = \\
 &= \underline{3 \sin x \cos^2 x} - \sin^3 x + \sin x = \\
 &= 3 \sin x (1 - \sin^2 x) - \sin^3 x + \sin x = \\
 &= 3 \sin x - 3 \sin^3 x - \sin^3 x + \sin x = \\
 &= 4 \sin x - 4 \sin^3 x = \text{RHS} \checkmark
 \end{aligned}$$

$$\begin{aligned}
 \sin^2 x + \cos^2 x &= 1 \\
 \cos^2 x &= 1 - \sin^2 x
 \end{aligned}$$

$$72. \cos^2 \frac{x}{2} = \frac{\sec x + 1}{2 \sec x}$$

$$\text{LHS} = \left(\cos \frac{x}{2} \right)^2 = \left(\pm \sqrt{\frac{1 + \cos x}{2}} \right)^2 = \frac{1 + \cos x}{2} =$$

$$= \frac{\left(1 + \frac{1}{\sec x}\right)}{2} \cdot \frac{\sec x}{\sec x} = \frac{\sec x + 1}{2 \sec x} = \text{RHS} \checkmark$$

$$76. \cos^2 \frac{x}{2} - \sin^2 \frac{x}{2} = \cos x$$

$$\begin{aligned} \text{LHS} &= \left(\cos \frac{x}{2} \right)^2 - \left(\sin \frac{x}{2} \right)^2 = \\ &= \left(\pm \sqrt{\frac{1+\cos x}{2}} \right)^2 - \left(\pm \sqrt{\frac{1-\cos x}{2}} \right)^2 = \\ &= \frac{1+\cos x}{2} - \frac{1-\cos x}{2} = \\ &= \frac{1+\cos x - (1-\cos x)}{2} = \frac{2\cos x}{2} = \cos x = \text{RHS} \end{aligned}$$

$$86. \frac{\cos 2x}{\sin^2 x} = \csc^2 x - 2$$

$$\begin{aligned} \text{LHS} &= \frac{1-2\sin^2 x}{\sin^2 x} = \frac{1}{\sin^2 x} - \frac{2\sin^2 x}{\sin^2 x} = \\ &= \csc^2 x - 2 = \text{RHS} \checkmark \end{aligned}$$

$$\frac{a \pm b}{c} = \frac{a}{c} \pm \frac{b}{c}$$

$$88. \quad \frac{2 \cos 2x}{\sin 2x} = \cot x - \tan x$$

$$\text{LHS} = \frac{2(\cos^2 x - \sin^2 x)}{2 \sin x \cos x} = \frac{\cos^2 x}{\sin x \cos x} - \frac{\sin^2 x}{\sin x \cos x}$$

$$= \frac{\cos x}{\sin x} - \frac{\sin x}{\cos x} = \cot x - \tan x = \text{RHS}$$

Homework #6 - Due Wednesday

- 6.1 #1-69 odd (proofs)
- 6.2 #1-41 odd
- 6.3 #1-24 all; 30-36 all; 49-93 odd

& **memorize your identities!!!**

