

2.39
1

$$\sin x + \cos 2x = \tan \frac{x}{2}$$

$$2 \sin(1.5x) \cos(0.5x) = \frac{\sin \frac{x}{2}}{\cos \frac{x}{2}}$$

$$2 \sin(1.5x) \cos^2(0.5x) = \sin(0.5x)$$

$$2 \sin(1.5x) [1 - \sin^2(0.5x)] = \sin(0.5x)$$

$$\begin{aligned} \sin(1.5x) &= \sin(x+0.5x) = \sin x \cos 0.5x + \cos x \sin 0.5x \\ &= 2 \sin(0.5x) \cos^2(0.5x) + (1 - 2\sin^2(0.5x)) \cos(0.5x) \\ &= 2 \sin(0.5x) [1 - \sin^2(0.5x)] + \sin(0.5x) - 2 \sin^3(0.5x) \\ &= 3 \sin(0.5x) - 4 \sin^3(0.5x) \end{aligned}$$

$$2 [3 \sin(0.5x) - 4 \sin^3(0.5x)] [1 - \sin^2(0.5x)] = \sin(0.5x)$$

$$\sin(0.5x) [6 - 8 \sin^2(0.5x)] [1 - \sin^2(0.5x)] - 1 = 0$$

$$\downarrow$$

$$0.5x = \pi k$$

$$\boxed{x = 2\pi k}$$

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0.5x = \pi k

$$6 - 8 \sin^2(0.5x) - 8 \sin^4(0.5x) + 8 \sin^4(0.5x) - 1 = 0$$

$$8 \sin^4(0.5x) - 14 \sin^2(0.5x) + 5 = 0$$

$$\sin^2(0.5x) = \frac{10}{8} \rightarrow \emptyset$$

$$\sin^2(0.5x) = \frac{1}{2} \rightarrow$$

$$0.5x = \frac{\pi}{4} + 2\pi k \rightarrow x = \frac{\pi}{2} + 4\pi k$$

$$0.5x = \frac{3\pi}{4} + 2\pi k \rightarrow x = \frac{3\pi}{2} + 4\pi k$$

$$0.5x = \frac{5\pi}{4} + 2\pi k \rightarrow x = \frac{5\pi}{2} + 4\pi k$$

$$0.5x = \frac{7\pi}{4} + 2\pi k \rightarrow x = \frac{7\pi}{2} + 4\pi k$$

$$x = \frac{\pi}{2} + \pi k$$

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0.5x = \pi k

$$\frac{x}{2} = \frac{\pi}{2} + \pi k$$

$$\boxed{x = \pi + 2\pi k}$$