

Find $\sin\left(\frac{5\pi}{12}\right)$. Hint: $\frac{5\pi}{12} = \frac{8\pi}{12} - \frac{3\pi}{12} = \frac{2\pi}{3} - \frac{\pi}{4}$

$$\begin{aligned}\sin\left(\frac{5\pi}{12}\right) &= \sin\left(\frac{8\pi}{12} - \frac{3\pi}{12}\right) = \sin\left(\frac{2\pi}{3} - \frac{\pi}{4}\right) = \sin\left(\frac{2\pi}{3}\right)\cos\left(\frac{\pi}{4}\right) - \sin\left(\frac{\pi}{4}\right)\cos\left(\frac{2\pi}{3}\right) \\ &= \frac{\sqrt{3}}{2} \cdot \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}} \cdot \frac{-1}{2} = \frac{\sqrt{3} + 1}{2\sqrt{2}}\end{aligned}$$