

Warmup 5: Use the sum or difference formula

to find the exact value of $\cos \frac{13\pi}{12} = \frac{3\pi}{12} + \frac{10\pi}{12}$

$$\cos \frac{13\pi}{12} = \cos \left(\frac{\pi}{4} + \frac{5\pi}{6} \right)$$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

$$= \cos \frac{\pi}{4} \cos \frac{5\pi}{6} - \sin \frac{\pi}{4} \sin \frac{5\pi}{6}$$

$$= \frac{\sqrt{2}}{2} \cdot \frac{-\sqrt{3}}{2} - \frac{\sqrt{2}}{2} \cdot \frac{1}{2}$$

$$= \frac{-\sqrt{6}}{4} - \frac{\sqrt{2}}{4}$$

$$= \boxed{\frac{-\sqrt{6} - \sqrt{2}}{4}} \text{ or } \boxed{\frac{-\sqrt{2} - \sqrt{6}}{4}}$$