

$$1. \sin 15^\circ = \sin(45^\circ - 30^\circ)$$

$$= \sin 45 \cos 30 - \cos 45 \sin 30$$

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

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

$$9. \cos \frac{7\pi}{12} = \cos \left(\frac{\pi}{3} + \frac{\pi}{4} \right)$$

$$= \cos \frac{\pi}{3} \cos \frac{\pi}{4} - \sin \frac{\pi}{3} \sin \frac{\pi}{4}$$

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

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

$$4. \cos 75^\circ = \cos(45^\circ + 30^\circ)$$

$$= \cos 45 \cos 30 - \sin 45 \sin 30$$

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

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

$$10. \sin \frac{-\pi}{12} = \sin \left(\frac{\pi}{6} - \frac{\pi}{4} \right) \quad \frac{2\pi}{12} - \frac{3\pi}{12}$$

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

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

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

$$11. \sin 42^\circ \cos 17^\circ - \cos 42^\circ \sin 17^\circ \\ = \sin(42 - 17) = \boxed{\sin 25^\circ}$$

$$19. \sin 3x \cos x - \cos 3x \sin x \\ = \sin(3x - x) = \boxed{\sin 2x}$$

$$21. \frac{\tan 2y + \tan 3x}{1 - \tan 2y \tan 3x} \\ = \boxed{\tan(2y + 3x)}$$

$$12. \cos 94^\circ \cos 18^\circ + \sin 94^\circ \sin 18^\circ \\ = \cos(94 - 18) = \boxed{\cos 76^\circ}$$

$$20. \cos 7y \cos 3y - \sin 7y \sin 3y \\ = \cos(7y + 3y) = \boxed{\cos 10y}$$