

$$\textcircled{1} \cos A \cos B = \sin A \sin B$$

$$\boxed{A} \cos A \cos B - \sin A \sin B = 0$$

$$\cos(A+B) = 0$$

$$\textcircled{2} \sin A \cos B = -\sin B \cos A$$

$$\boxed{A} \sin A \cos B + \sin B \cos A = 0$$

$$\sin(A+B) = 0$$

$$\textcircled{3} f(x) = \sin x \cos 2x + \cos x \sin 2x$$

$$f(x) = \sin(x+2x)$$

$$\boxed{D} f(x) = \sin 3x, \quad B=3 = \# \text{cycles in } 2\pi$$

$$\textcircled{4} \sin\left(-\frac{\pi}{12}\right) = -\sin\left(\frac{\pi}{12}\right) = -\sin\left(\frac{4\pi}{12} - \frac{3\pi}{12}\right) = -\sin\left(\frac{\pi}{3} - \frac{\pi}{4}\right)$$

$$\boxed{D} = -\left[\sin\frac{\pi}{3}\cos\frac{\pi}{4} - \sin\frac{\pi}{4}\cos\frac{\pi}{3}\right]$$

$$= -\left[\left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)\right] = -\left[\frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}\right] = -\left[\frac{\sqrt{6}-\sqrt{2}}{4}\right] = \frac{\sqrt{2}-\sqrt{6}}{4}$$

$$\textcircled{5} \sin 133^\circ \cos 58^\circ + \cos 133^\circ \sin 58^\circ$$

$$\boxed{B} \sin(133^\circ + 58^\circ) = \sin 191^\circ$$

$$\textcircled{6} \text{(a)} \sin\frac{8\pi}{12}$$

$$\sin\left(\frac{8\pi}{12} - \frac{3\pi}{12}\right)$$

$$\sin\left(\frac{5\pi}{4} - \frac{\pi}{4}\right)$$

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

$$\left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{2}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(-\frac{1}{2}\right)$$

$$\frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4}$$

$$\boxed{\frac{\sqrt{6} + \sqrt{2}}{4}}$$

$$\text{(b)} \cos\frac{7\pi}{12}$$

$$\cos\left(\frac{9\pi}{12} - \frac{2\pi}{12}\right)$$

$$\cos\left(\frac{3\pi}{4} - \frac{\pi}{6}\right)$$

$$\cos\frac{3\pi}{4}\cos\frac{\pi}{6} + \sin\frac{3\pi}{4}\sin\frac{\pi}{6}$$

$$\left(-\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) + \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)$$

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

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

$$\text{(c)} \tan\frac{11\pi}{12}$$

$$\tan\left(\frac{14\pi}{12} - \frac{3\pi}{12}\right)$$

$$\tan\left(\frac{7\pi}{6} - \frac{\pi}{4}\right)$$

$$\frac{\tan\frac{7\pi}{6} - \tan\frac{\pi}{4}}{1 + \tan\frac{7\pi}{6}\tan\frac{\pi}{4}}$$

$$\frac{\frac{\sqrt{3}}{3} - 1}{1 + \frac{\sqrt{3}}{3}(1)} \left(\frac{3}{3}\right)$$

$$\frac{\sqrt{3}-3}{\sqrt{3}+3} \left(\frac{\sqrt{3}-3}{\sqrt{3}-3}\right)$$

$$\frac{3-6\sqrt{3}+9}{3-9}$$

$$\frac{12-6\sqrt{3}}{-6}$$

$$\frac{-6(\sqrt{3}-2)}{-6}$$

$$\boxed{\sqrt{3}-2}$$

7 (a) $\sin \frac{2\pi}{13} \cos \frac{3\pi}{4} - \sin \frac{3\pi}{4} \cos \frac{2\pi}{13}$

$$\sin\left(\frac{2\pi}{13} - \frac{3\pi}{4}\right)$$

$$\sin\left(\frac{8\pi - 39\pi}{52}\right)$$

$$\sin\left(-\frac{31\pi}{52}\right)$$

$$-\sin\left(\frac{31\pi}{52}\right)$$

(b) $\frac{\tan \frac{\pi}{9} - \tan \frac{\pi}{3}}{1 + \tan \frac{\pi}{9} \tan \frac{\pi}{3}}$

$$\frac{\tan\left(\frac{\pi}{9} - \frac{\pi}{3}\right)}{1 + \tan \frac{\pi}{9} \tan \frac{\pi}{3}}$$

$$\tan\left(\frac{3\pi - 5\pi}{9}\right)$$

$$\tan\left(-\frac{2\pi}{9}\right)$$

$$-\tan\left(\frac{2\pi}{9}\right)$$

$$-\tan\left(\frac{2\pi}{15}\right)$$

8 (a) $f(x) = \sin 3x \cos 2 - \cos 3x \sin 2$

$$f(x) = \sin(3x - 2)$$

$$f(x) = \sin\left(3\left(x - \frac{2}{3}\right)\right)$$

(b) $g(x) = 2\cos 2 \cos 2x + 2\sin 2 \sin 2x - 2$

$$g(x) = 2[\cos 2 \cos 2x + \sin 2 \sin 2x] - 2$$

$$g(x) = 2\cos(2 - 2x) - 2$$

$$g(x) = 2\cos(-2(x - 1)) - 2$$

$$g(x) = 2\cos(2(x - 1)) - 2$$

9 (a) $\cos\left(x - \frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}(\cos x + \sin x)$

$$\cos x \cos \frac{\pi}{4} + \sin x \sin \frac{\pi}{4}$$

$$\frac{\sqrt{2}}{2} \cos x + \frac{\sqrt{2}}{2} \sin x$$

$$\frac{\sqrt{2}}{2}(\cos x + \sin x) \quad \text{— done}$$

(b) $\cos(x - y) + \cos(x + y) = 2\cos x \cos y$

$$\cos x \cos y + \sin x \sin y + \cos x \cos y - \sin x \sin y$$

$$\cos x \cos y + \cos x \cos y$$

$$2\cos x \cos y \quad \text{— done}$$

(c) $\sin 2x = 2\sin x \cos x$

$$\sin(x + x)$$

$$\sin x \cos x + \sin x \cos x$$

$$2\sin x \cos x \quad \text{— done}$$

(d) $\sin 3u = 3\cos^2 u \sin u - \sin^3 u$

$$\sin(2u + u)$$

$$\sin 2u \cos u + \sin u \cos 2u$$

$$(\sin u \cos u + \sin u \cos u) \cos u + \sin u (\cos u \cos u - \sin u \sin u)$$

$$(2\sin u \cos u) \cos u + \sin u (\cos^2 u - \sin^2 u)$$

$$2\sin u \cos^2 u + \sin u \cos^2 u - \sin^3 u$$

$$3\sin u \cos^2 u - \sin^3 u \quad \text{— done}$$

⑨ ** (e) $\cos 3x + \cos x = 2 \cos 2x \cos x$

$$\cos(2x+x) + \cos(2x-x)$$

$$\cos 2x \cos x - \sin 2x \sin x + \cos 2x \cos x + \sin 2x \sin x$$

$$\cos 2x \cos x + \cos 2x \cos x$$

$$2 \cos 2x \cos x \quad - \text{done}$$

④ $\cos 2x = \cos^2 x - \sin^2 x$

$$\cos(x+x)$$

$$\cos x \cos x - \sin x \sin x$$

$$\cos^2 x - \sin^2 x \quad \text{done}$$

⑩ $\theta = \arccos x$

$$\sin(2 \arccos x)$$

$$\sin(2\theta)$$

$$2 \sin \theta \cos \theta$$

$$2(\sqrt{1-x^2})(x)$$

$$\boxed{2x\sqrt{1-x^2}}$$

