

10-1 & 10-2 Practice

Find the exact value of each.

$$\begin{aligned}
 1) \sin 195^\circ &= \sin(150+45) \\
 &= \sin 150 \cos 45 + \cos 150 \sin 45 \\
 &= \frac{1}{2} \cdot \frac{\sqrt{2}}{2} + \frac{-\sqrt{3}}{2} \cdot \frac{\sqrt{2}}{2} \\
 &= \frac{\sqrt{2}}{4} - \frac{\sqrt{6}}{4} \\
 &= \boxed{\frac{\sqrt{2}-\sqrt{6}}{4}}
 \end{aligned}$$

$$\begin{aligned}
 3) \cos 255^\circ &= \cos(225+30) \\
 &= \cos 225 \cos 30 - \sin 225 \sin 30 \\
 &= \frac{-\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} - \frac{-\sqrt{2}}{2} \cdot \frac{1}{2} \\
 &= \frac{-\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \boxed{\frac{-\sqrt{6}+\sqrt{2}}{4}}
 \end{aligned}$$

$$\begin{aligned}
 5) \tan 105^\circ &= \tan(60+45) \\
 \frac{\tan 60 + \tan 45}{1 - \tan 60 \tan 45} &= \frac{\sqrt{3} + 1}{1 - (\sqrt{3} \cdot 1)} = \frac{\sqrt{3} + 1}{1 - \sqrt{3}} \\
 \frac{\sqrt{3} + 1}{1 - \sqrt{3}} \cdot \frac{1 + \sqrt{3}}{1 + \sqrt{3}} &= \frac{\sqrt{3} + 3 + 1 + \sqrt{3}}{1 + \sqrt{3} - \sqrt{3} - 3} = \frac{4 + 2\sqrt{3}}{-2} = \boxed{-2 - \sqrt{3}}
 \end{aligned}$$

$$\begin{aligned}
 7) \sin 138^\circ \cos 48^\circ - \cos 138^\circ \sin 48^\circ \\
 &= \sin(138^\circ - 48^\circ) = \sin 90^\circ \\
 &= \boxed{1}
 \end{aligned}$$

$$\begin{aligned}
 2) \sin \frac{11\pi}{12} &= \sin\left(\frac{3\pi}{12} + \frac{8\pi}{12}\right) = \left(\sin \frac{\pi}{4} + \frac{2\pi}{3}\right) \\
 &= \sin \frac{\pi}{4} \cos \frac{2\pi}{3} + \cos \frac{\pi}{4} \sin \frac{2\pi}{3} \\
 &= \frac{\sqrt{2}}{2} \cdot \frac{-1}{2} + \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} \\
 &= \frac{-\sqrt{2}}{4} + \frac{\sqrt{6}}{4} = \boxed{\frac{-\sqrt{2}+\sqrt{6}}{4}}
 \end{aligned}$$

$$\begin{aligned}
 4) \cos \frac{13\pi}{12} &= \cos\left(\frac{9\pi}{12} + \frac{4\pi}{12}\right) = \cos\left(\frac{3\pi}{4} + \frac{\pi}{3}\right) \\
 &= \cos \frac{3\pi}{4} \cos \frac{\pi}{3} - \sin \frac{3\pi}{4} \sin \frac{\pi}{3} \\
 &= \frac{-\sqrt{2}}{2} \cdot \frac{1}{2} - \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} \\
 &= \frac{-\sqrt{2}}{4} - \frac{\sqrt{6}}{4} = \boxed{\frac{-\sqrt{2}-\sqrt{6}}{4}}
 \end{aligned}$$

$$\begin{aligned}
 6) \tan \frac{7\pi}{12} &= \tan\left(\frac{3\pi}{12} + \frac{4\pi}{12}\right) = \tan\left(\frac{\pi}{4} + \frac{\pi}{3}\right) \\
 &= \frac{\tan \frac{\pi}{4} + \tan \frac{\pi}{3}}{1 - \tan \frac{\pi}{4} \tan \frac{\pi}{3}} = \frac{1 + \sqrt{3}}{1 - 1 \cdot \sqrt{3}} \\
 &= \frac{1 + \sqrt{3}}{1 - \sqrt{3}} \cdot \frac{1 + \sqrt{3}}{1 + \sqrt{3}} = \frac{1 + \sqrt{3} + \sqrt{3} + 3}{1 + \sqrt{3} - \sqrt{3} - 3} \\
 &= \frac{4 + 2\sqrt{3}}{-2} = \boxed{-2 - \sqrt{3}}
 \end{aligned}$$

$$\begin{aligned}
 8) \sin \frac{13\pi}{18} \cos \frac{2\pi}{9} - \cos \frac{13\pi}{18} \sin \frac{2\pi}{9} \\
 &= \sin\left(\frac{13\pi}{18} - \frac{2\pi}{9}\right) \\
 &= \sin\left(\frac{13\pi}{18} - \frac{4\pi}{18}\right) \\
 &= \sin \frac{9\pi}{18} \\
 &= \sin \frac{\pi}{2} = \boxed{1}
 \end{aligned}$$

$$9) \cos 101^\circ \cos 41^\circ + \sin 101^\circ \sin 41^\circ$$

$$= \cos (101^\circ - 41^\circ)$$

$$= \cos 60^\circ$$

$$= \boxed{\frac{1}{2}}$$

$$11) \frac{\tan 233^\circ - \tan 113^\circ}{1 + \tan 233^\circ \tan 113^\circ}$$

$$= \tan (233^\circ - 113^\circ)$$

$$= \tan 120^\circ$$

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

Simplify.

$$13) \sin 6u \cos u + \cos 6u \sin u$$

$$= \sin (6u + u)$$

$$= \boxed{\sin (7u)}$$

$$15) \cos 6x \cos 6x - \sin 6x \sin 6x$$

$$= \cos (6x + 6x)$$

$$= \boxed{\cos (12x)}$$

$$17) \frac{\tan 6u - \tan u}{1 + \tan 6u \tan u}$$

$$= \tan (6u - u)$$

$$= \boxed{\tan (5u)}$$

$$10) \cos \frac{8\pi}{9} \cos \frac{7\pi}{18} + \sin \frac{8\pi}{9} \sin \frac{7\pi}{18}$$

$$= \cos \left(\frac{8\pi}{9} - \frac{7\pi}{18} \right)$$

$$= \cos \left(\frac{16\pi}{18} - \frac{7\pi}{18} \right)$$

$$= \cos \left(\frac{9\pi}{18} \right) = \cos \frac{\pi}{2} = \boxed{0}$$

$$12) \frac{\tan \frac{26\pi}{9} - \tan \frac{19\pi}{18}}{1 + \tan \frac{26\pi}{9} \tan \frac{19\pi}{18}}$$

$$= \tan \left(\frac{26\pi}{9} - \frac{19\pi}{18} \right)$$

$$= \tan \left(\frac{52\pi}{18} - \frac{19\pi}{18} \right)$$

$$= \tan \frac{33\pi}{18} = \tan \left(\frac{11\pi}{6} \right) = \boxed{-\frac{\sqrt{3}}{3}}$$

$$14) \sin -6\theta \cos 2\theta - \cos -6\theta \sin 2\theta$$

$$= \sin (-6\theta - 2\theta)$$

$$= \boxed{\sin (-8\theta)}$$

$$16) \cos 6u \cos -5u + \sin 6u \sin -5u$$

$$= \cos (6u - 5u)$$

$$= \boxed{\cos (u)}$$

$$18) \frac{\tan u - \tan -5u}{1 + \tan u \tan -5u}$$

$$= \tan (u - (-5u))$$

$$= \boxed{\tan (6u)}$$