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9.) $\sin\left(\frac{5\pi}{12}\right) = \sin\left(\frac{2\pi}{12} + \frac{3\pi}{12}\right) = \sin\left(\frac{\pi}{6} + \frac{\pi}{4}\right)$

$= \sin\left(\frac{\pi}{6}\right)\cos\left(\frac{\pi}{4}\right) + \sin\left(\frac{\pi}{4}\right)\cos\left(\frac{\pi}{6}\right)$

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

10) $\tan\left(\frac{5\pi}{12}\right) = \tan\left(\frac{2\pi}{12} + \frac{3\pi}{12}\right) = \tan\left(\frac{\pi}{6} + \frac{\pi}{4}\right) = \frac{\tan\left(\frac{\pi}{6}\right) + \tan\left(\frac{\pi}{4}\right)}{1 - \tan\left(\frac{\pi}{6}\right)\tan\left(\frac{\pi}{4}\right)}$

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

15) $\sin(76^\circ)\cos(31^\circ) - \cos(76^\circ)\sin(31^\circ)$

$= \sin(45^\circ) = \frac{\sqrt{2}}{2}$

22) $\frac{\tan\left(\frac{5\pi}{12}\right) + \tan\left(\frac{\pi}{4}\right)}{1 - \tan\left(\frac{5\pi}{12}\right)\tan\left(\frac{\pi}{4}\right)} = \tan\left(\frac{5\pi}{12} + \frac{\pi}{4}\right) = \tan\left(\frac{5\pi}{12} + \frac{3\pi}{12}\right)$

$= \tan\left(\frac{8\pi}{12}\right) = \tan\left(\frac{2\pi}{3}\right) = -\sqrt{3}$

Verify

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

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

$= 2\sin(x)\cos(x)$ ✓

Verify

58) $\sin(x+y) + \sin(x-y) \neq 2\sin(x)\cos(y)$

$[\sin(x)\cos(y) + \cos(x)\sin(y)]$

$+ [\sin(x)\cos(y) - \cos(x)\sin(y)]$

$= 2\sin(x)\cos(y)$ ✓

Verify

59.) $\sin(210^\circ + x) + \cos(120^\circ + x) = 0$

$= \cos(90 - (210^\circ - x)) - \cos(120^\circ + x)$

$= \cos(-120 - x) - \cos(120^\circ + x)$

$= \cos(-(120^\circ + x)) - \cos(120 + x)$

$= \cos(120^\circ + x) - \cos(120 + x)$

$= 0$ ✓