7.2 3,6,13,17,21,29,34,49

3. $\sin 165° = \sin(45° + 120°)$

$= \sin 45° \cos 120° + \cos 45° \sin 120°$

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

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

6. $\cos \frac{11\pi}{12} = \cos\left(\frac{8\pi}{12} + \frac{3\pi}{12}\right) = \cos\left(\frac{2\pi}{3} + \frac{\pi}{4}\right)$

$= \cos \frac{2\pi}{3} \cos \frac{\pi}{4} - \sin \frac{2\pi}{3} \sin \frac{\pi}{4}$

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

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

13. $\cos \frac{3\pi}{7} \cos \frac{2\pi}{21} + \sin \frac{3\pi}{7} \sin \frac{2\pi}{21} = \cos\left(\frac{3\pi}{7} - \frac{2\pi}{21}\right)$

$= \cos\left(\frac{9\pi}{21} - \frac{2\pi}{21}\right) = \cos\left(\frac{7\pi}{21}\right)$

$= \cos\left(\frac{\pi}{3}\right) = \frac{1}{2}.$

17. $\tan\left(\frac{\pi}{2} - u\right) = \cot u$

$\tan\left(\frac{\pi}{2} - u\right) = \frac{\tan\frac{\pi}{2} - \tan u}{1 + \tan\frac{\pi}{2} \tan u}$ but here is a problem since $\tan\frac{\pi}{2}$ is undefined

To get around this, we employ the substitution $\tan\left(\frac{\pi}{2} - u\right) = \frac{\sin(\frac{\pi}{2} - u)}{\cos(\frac{\pi}{2} - u)}$.

LHS $= \frac{\sin\left(\frac{\pi}{2} - u\right)}{\cos\left(\frac{\pi}{2} - u\right)} = \frac{\sin\frac{\pi}{2} \cos u - \cos\frac{\pi}{2} \sin u}{\cos\frac{\pi}{2} \cos u + \sin\frac{\pi}{2} \sin u}$

$= \frac{1 \cdot \cos u - 0 \cdot \sin u}{0 \cdot \cos u + 1 \cdot \sin u}$

$= \frac{\cos u}{\sin u} = \cot u = \text{RHS}.$

21. $\sin\left(x - \frac{\pi}{2}\right) = -\cos x$

LHS $= \sin\left(x - \frac{\pi}{2}\right) = \sin x \cos\frac{\pi}{2} - \cos x \sin\frac{\pi}{2}$

$= \sin x \cdot 0 - \cos x \cdot 1$

$= -\cos x = \text{RHS}$

29 $\sin(x+y) - \sin(x-y) = 2\cos x \sin y.$

$$\begin{aligned}
LHS &= \sin(x+y) - \sin(x-y) \\
&= (\sin x \cos y + \cos x \sin y) - (\sin x \cos y - \cos x \sin y) \\
&= \cos x \sin y - -\cos x \sin y \qquad \text{[The first and third terms cancel]} \\
&= 2\cos x \sin y = RHS
\end{aligned}$$

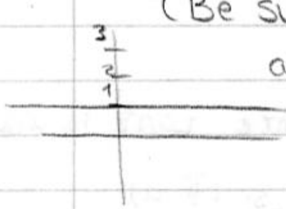
34 $1 - \tan x \tan y = \dfrac{\cos(x+y)}{\cos x \cos y}$

$$\begin{aligned}
RHS = \frac{\cos(x+y)}{\cos x \cos y} &= \frac{\cos x \cos y - \sin x \sin y}{\cos x \cos y} \\
&= \frac{\cos x \cos y}{\cos x \cos y} - \frac{\sin x}{\cos x} \cdot \frac{\sin y}{\cos y} \\
&= 1 - \tan x \tan y = LHS
\end{aligned}$$

49. $y = \sin^2(x + \frac{\pi}{4}) + \sin^2(x - \frac{\pi}{4})$

$Y_1 = \sin(X + \pi/4)^2 + \sin(X - \pi/4)^2$

(Be sure to be in radian mode when graphing)



a) The graph suggests that $\sin^2(x+\frac{\pi}{4}) + \sin^2(x - \pi/4) = 1.$

b) $LHS = \sin^2(X + \frac{\pi}{4}) + \sin^2(x - \frac{\pi}{4})$

$$\begin{aligned}
&= \left(\sin x \cos\tfrac{\pi}{4} + \cos x \sin\tfrac{\pi}{4}\right)^2 + \left(\sin x \cos\tfrac{\pi}{4} - \cos x \sin\tfrac{\pi}{4}\right)^2 \\
&= \left(\tfrac{\sqrt{2}}{2}(\sin x + \cos x)\right)^2 + \left(\tfrac{\sqrt{2}}{2}(\sin x - \cos x)\right)^2 \\
&= \tfrac{1}{2}(\sin x + \cos x)^2 + \tfrac{1}{2}(\sin x - \cos x)^2 \\
&= \tfrac{1}{2}(\sin^2 x + 2\sin x \cos x + \cos^2 x) + \tfrac{1}{2}(\sin^2 x - 2\sin x \cos x + \cos^2 x) \\
&= \tfrac{1}{2}(2\sin^2 x + 2\cos^2 x) \\
&= \sin^2 x + \cos^2 x \\
&= 1 = RHS.
\end{aligned}$$

END OF 7.2