NOTE: No calculators are allowed for this quiz!

1. Express each of the following in terms of its related acute angle using a related identity. Then evaluate.

[3,3]

a) $\cot\left(\frac{15\pi}{4}\right) = \cot\left(\frac{12\pi}{4}+\frac{3\pi}{4}\right)$

$= \cot\left(3\pi + \frac{2\pi}{4} + \frac{\pi}{4}\right)$

$= \cot\left(\pi + \frac{3\pi}{4}\right)$

$= \frac{1}{\tan(\pi + \frac{3\pi}{4})} = \frac{1}{\tan(\frac{3\pi}{4})} = \frac{1}{\tan(\frac{\pi}{2}+\frac{\pi}{4})} = \frac{1}{-\cot(\frac{\pi}{4})} = -\tan\frac{\pi}{4} = -1$

b) $\sec\left(-\frac{5\pi}{3}\right) = \frac{1}{\cos(-\pi - \frac{2\pi}{3})}$

$= \frac{1}{\cos(-(\pi + \frac{2\pi}{3}))}$

$= \frac{1}{-\cos(\frac{2\pi}{3})} = \frac{1}{-(-\frac{1}{2})} = 2$

2. Use the co-function identities to write an equivalent expression to each of the following. **[1, 1]**

a) $\sec\left(\frac{\pi}{6}\right) = \csc\left(\frac{\pi}{2} - \frac{\pi}{6}\right)$

$= \csc\left(\frac{2\pi}{6}\right)$

$= \csc\left(\frac{\pi}{3}\right)$

b) $\tan\left(\frac{7\pi}{12}\right) = \cot\left(\frac{\pi}{2} - \frac{7\pi}{12}\right)$

$= \cot\left(\frac{6\pi}{12} - \frac{7\pi}{12}\right)$

$= \cot\left(\frac{-\pi}{12}\right)$

$= -\cot\left(\frac{\pi}{12}\right)$

Note, this test not marked, its practis IDK if right

3. If $\csc\left(\frac{2\pi}{7}\right) = 1.2790$, evaluate $\cos\left(\frac{3\pi}{14}\right)$ using a co-function identity. You may leave your answer in fraction form. [3]

$\cos\frac{3\pi}{14} = \sin\left(\frac{\pi}{2} - \frac{3\pi}{14}\right) = \sin\left(\frac{4\pi}{14}\right) = \sin\frac{2\pi}{7}$

$\frac{1}{\sin\frac{2\pi}{7}} = 1.2790$

then $\sin\frac{2\pi}{7} = \frac{1}{1.2790}$

$= \frac{1}{1.2790}$

$= \frac{10000}{12790}$

$= \frac{1000}{1279}$

4. Simplify the given expresion, then determine an exact value. [3]

$\cos\frac{10\pi}{9}\cos\frac{5\pi}{18} + \sin\frac{10\pi}{9}\sin\frac{5\pi}{18} =$

$= \cos\left(\frac{10\pi}{9} - \frac{5\pi}{18}\right)$

$= \cos\left(\frac{20\pi}{18} - \frac{5\pi}{18}\right) = \cos\left(\frac{15\pi}{18}\right) = \cos\left(\frac{\pi}{2} + \frac{6\pi}{18}\right) = \cos\left(\frac{\pi}{2} + \frac{\pi}{3}\right) = -\sin\left(\frac{\pi}{3}\right)$

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

5. determine the exact value of [5, 5]

a) $\sin\left(-\frac{11\pi}{12}\right)$

$\sin\left(-\frac{11\pi}{12}\right) = -\sin\left(\frac{11\pi}{12}\right) = -\sin\left(\pi - \frac{\pi}{12}\right)$

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

b) $\tan\left(\frac{23\pi}{12}\right) = \tan\left(\pi + \frac{11\pi}{12}\right)$

$= \tan\left(\frac{11\pi}{12}\right)$

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

6. Derive the angle formula for cos3x using a compound angle formula. [5]

$\cos(3x) = \cos(2x + x) = \cos 2x \cos x - \sin 2x \sin x$

$= (2\cos^2 x - 1)\cos x - 2\sin x \cos x \sin x$

$= 2\cos^3 x \cancel{- \cos x} - 2\sin^2 x \cancel{\cos x}$

$= 2\cos^3 x - 2\sin^2 x$ ← Leave like this simpler

7. Given $\sin A = \frac{3}{5}$ where $\frac{\pi}{2} \le A \le \pi$ and $\cos B = -\frac{12}{13}$ where $\pi \le B \le \frac{3\pi}{2}$, evaluate [12]

a) csc(A + B)
b) sec(A – B)
c) sin2A
d) cos2B

$13 \times 13 = 39 \ldots 169$

a) $\csc(A+B) = \frac{1}{\sin(A+B)} = \frac{1}{\sin A \cos B + \cos A \sin B}$

$= \frac{1}{\left(\frac{3}{5}\right)\left(\frac{-12}{13}\right) + \left(\frac{-4}{5}\right)\left(\frac{-5}{13}\right)}$

$= \frac{1}{\left(\frac{-36}{65}\right) + \left(\frac{20}{65}\right)}$

$= \frac{1}{\frac{-16}{65}}$

$= \frac{-65}{16}$

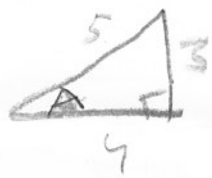
b) $\sec(A-B)$

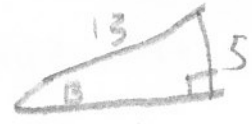
$= \frac{1}{\cos(A-B)} = \frac{1}{\cos A \cos B + \sin A \sin B}$

$= \frac{1}{\left(\frac{-4}{5}\right)\left(\frac{-12}{13}\right) + \left(\frac{3}{5}\right)\left(\frac{-5}{13}\right)}$

$\frac{48}{65} + \frac{-15}{65}$

$= \frac{1}{\frac{33}{65}} = \frac{65}{33}$





$13^2 - 12^2 = 5^2$

$169 - 144 = 25$

$13 \times 5 = 65$

c) $\sin 2A = 2\sin A \cos A$

$= 2\left(\frac{3}{5}\right)\left(\frac{-4}{5}\right) = \frac{-24}{25}$

d) $\cos 2B = 2\cos^2(B) - 1$

$= 2\left(\frac{-12}{13}\right)^2 - 1$

$= 2\left(\frac{144}{169}\right) - 1$

$\frac{288}{} - 1$

$288 - 169 = 1\ldots$

8. Simplify the following: [8, 8]

a) $$\frac{\cos(2\pi - x)\sin(\frac{3\pi}{2}+x)\tan(5\pi+x)}{\cos(13\pi+x)\sec(\frac{7\pi}{2}-x)\cot(x-\frac{9\pi}{2})}$$

$$= \frac{\cos x(-\cos x)(\tan x)}{\cos(\pi+x)(\sec(\frac{3\pi}{2}-x))\frac{1}{\tan(x-\frac{\pi}{2})}}$$

$$= \frac{-\cos^2 x\left(\frac{\sin x}{\cancel{\cos x}}\right)}{-\cos x \ \frac{1}{-\sin x} \ \frac{1}{\cot x}}$$

$$= \frac{-\cancel{\cos x}\sin x}{\cancel{-\cos x}\left(\frac{1}{-\sin x}\right)\tan x}$$

$$= \frac{\sin x}{\left(\frac{1}{-\sin x}\right)\left(\frac{\cancel{\sin x}}{\cos x}\right)} = -\sin x\cos x$$

There are also restrictions

$\sin x \neq 0, \cos x \neq 0$

b) $$\frac{\cos(2x)+\sin(2x)+1}{-\cos(2x)+\sin(2x)+1}$$

$$= \frac{2\cos^2 x - \cancel{1} + 2\sin x\cos x + \cancel{1}}{\cancel{-1} + 2\sin^2 x + 2\sin x\cos x + \cancel{1}}$$

$$= \frac{\cancel{2}\cos x(\cancel{\cos x + \sin x})}{\cancel{2}\sin x(\cancel{\sin x + \cos x})}$$

$$= \frac{\cos x}{\sin x} = \cot x$$

$\sin x \neq 0$

$\sin x + \cos x \neq 0$