Name ______________________

PreCalc

Unit 7: Review for Test

NO CALCULATORS!

Complete the formulas below:

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

$\cos(A+B) = \cos A\cos B - \sin A\sin B$

$\sin(A-B) = \sin A\cos B - \cos A\sin B$

$\cos(A-B) = \cos A\cos B + \sin A\sin B$

$\tan(A+B) = \dfrac{\tan A + \tan B}{1 - \tan A\tan B}$

$\tan(A-B) = \dfrac{\tan A - \tan B}{1 + \tan A\tan B}$

Double Angles

$\sin 2A = 2\sin A\cos A$

$\cos 2A = \cos^2 A - \sin^2 A$

$\cos 2A = 2\cos^2 A - 1$

$\cos 2A = 1 - 2\sin^2 A$

Half Angles

$\sin \frac{1}{2}A = \pm\sqrt{\dfrac{1-\cos A}{2}}$

$\cos \frac{1}{2}A = \pm\sqrt{\dfrac{1+\cos A}{2}}$

What are the three Pythagorean Identities?

1. $\sin^2 x + \cos^2 x = 1$
2. $1 + \cot^2 x = \csc^2 x$
3. $\tan^2 x + 1 = \sec^2 x$

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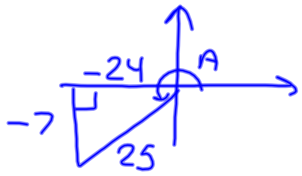
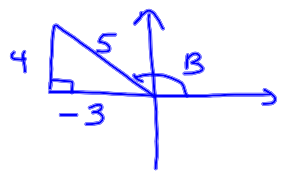
If $\sin A = -\frac{7}{25}$, $\pi \le A \le \frac{3\pi}{2}$, $\cos B = -\frac{3}{5}$, and B is in quadrant II, find each of the following: (you MUST draw triangles!)





a. $\tan(A - B)$

$$\frac{\frac{3\cdot 24}{1}}{\frac{3\cdot 24}{1}} \cdot \frac{\frac{7}{24} - \left(-\frac{4}{3}\right)}{1 + \left(\frac{7}{24}\right)\left(-\frac{4}{3}\right)} \cdot \frac{\frac{3\cdot 24}{1}}{\frac{3\cdot 24}{1}} = \frac{21+96}{72-28} = \frac{117}{44}$$

b. $\sin(A + B)$

$$= \left(-\frac{7}{25}\right)\left(-\frac{3}{5}\right) + \left(-\frac{24}{25}\right)\left(\frac{4}{5}\right)$$

$$= \frac{21}{125} - \frac{96}{125} = -\frac{75}{125} = -\frac{3}{5}$$

c. $\cos(A - B)$

$$= \left(-\frac{24}{25}\right)\left(-\frac{3}{5}\right) + \left(-\frac{7}{25}\right)\left(\frac{4}{5}\right)$$

$$= \frac{72}{125} - \frac{28}{125} = \frac{44}{125}$$

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d. $\cos 2B$

$2\left(-\frac{3}{5}\right)^2 - 1 = \frac{18}{25} - 1 = \frac{-7}{25}$

or

$1 - 2\left(\frac{4}{5}\right)^2 = 1 - \frac{32}{25} = \frac{-7}{25}$

e. $\sin \frac{1}{2} A =$

$= \sqrt{\frac{25 \cdot 1 - \left(\frac{-24}{25}\right) 25}{25 \cdot 2}} = \sqrt{\frac{25+24}{50}} = \sqrt{\frac{49}{50}} = \frac{7}{\sqrt{50}} = \frac{7}{5\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{7\sqrt{2}}{10}$

f. $\cos \frac{1}{2} B =$

$= \sqrt{\frac{5 \cdot 1 + \left(-\frac{3}{5}\right) \cdot 5}{5 \cdot 2}} = \sqrt{\frac{5-3}{10}} = \sqrt{\frac{2}{10}} = \sqrt{\frac{1}{5}} = \frac{1}{\sqrt{5}} \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5}$

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Use the half angle identities to find the exact value of $\sin \frac{5\pi}{12}$.

$\frac{5\pi}{12} = \frac{1}{2}(\,?\,)$

$\frac{5\pi}{6}$ $\quad \theta = \frac{5\pi}{6}$

$\sin \frac{1}{2}\left(\frac{5\pi}{6}\right) = \sqrt{\frac{1 - \cos\frac{5\pi}{6}}{2}} = \sqrt{\frac{2 \cdot 1 - \left(-\frac{\sqrt{3}}{2}\right) \cdot 2}{2 \cdot 2}}$

$= \sqrt{\frac{2+\sqrt{3}}{4}}$ or $\frac{\sqrt{2+\sqrt{3}}}{2}$

Simplify and evaluate.

a. $\sin\left(\frac{\pi}{9}\right)\cos\left(\frac{2\pi}{9}\right) + \cos\left(\frac{\pi}{9}\right)\sin\left(\frac{2\pi}{9}\right)$

$\sin\left(\frac{\pi}{9} + \frac{2\pi}{9}\right) = \sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

b. $\cos\left(\frac{5\pi}{9}\right)\cos\left(\frac{\pi}{18}\right) + \sin\left(\frac{5\pi}{9}\right)\sin\left(\frac{\pi}{18}\right)$

$\cos\left(\frac{5\pi}{9} - \frac{\pi}{18}\right) = \cos\frac{\pi}{2} = 0$

c. $\dfrac{\tan\left(\frac{\pi}{6}\right) + \tan\left(\frac{\pi}{12}\right)}{1 - \tan\left(\frac{\pi}{6}\right)\tan\left(\frac{\pi}{12}\right)} = \tan\left(\frac{\pi}{6} + \frac{\pi}{12}\right) = \tan\frac{3\pi}{12} = \tan\frac{\pi}{4} = 1$

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Simplify:

a. sinWcotWtanW

$= \frac{\sin W}{1} \cdot \frac{\cos W}{\sin W} \cdot \frac{\sin W}{\cos W}$

$= \sin W$

b. $\tan\theta(\tan\theta + \cot\theta)$

$= \tan^2\theta + \tan\theta\cot\theta$

$= \tan^2\theta + 1$

$= \sec^2\theta$

c. $\cos(A - \pi)$ Pt $(-1, 0)$

$= \cos A \cos\pi + \sin A \sin\pi$

$= \cos A(-1) + \sin A(0)$

$= -\cos A$

d. $\sin\left(B + \frac{\pi}{2}\right)$ $P(0,1)$

$= \sin B \cos\frac{\pi}{2} + \cos B \sin\frac{\pi}{2}$

$= \sin B \cdot 0 + \cos B \cdot 1$

$= \cos B$

e. $\tan\left(x - \frac{\pi}{3}\right)$

$= \frac{\tan x - \tan\frac{\pi}{3}}{1 + \tan x \tan\frac{\pi}{3}} = \frac{\tan x - \sqrt{3}}{1 + \sqrt{3}\tan x}$

f. $\tan^3 x + 1$ $a = \tan x$ $b = 1$

$= (\tan x + 1)(\tan^2 x - \tan x + 1)$

g. $\sin A + \cot A \cos A$

$\frac{\sin A}{\sin A} \cdot \frac{\sin A}{1} + \frac{\cos^2 A}{\sin A}$

$= \frac{\sin^2 A + \cos^2 A}{\sin A}$

$= \frac{1}{\sin A} = \csc A$

h. $\frac{1 - \sec\theta}{1 - \sec^2\theta}$

$= \frac{1 - \sec\theta}{(1 - \sec\theta)(1 + \sec\theta)}$

$= \frac{1}{1 + \sec\theta}$

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Prove each Identity:

a. $\frac{\tan x - \cot x}{\sin x \cos x} = \sec^2 x - \csc^2 x$

$\frac{\sin x \cos x}{1} \cdot \frac{\frac{\sin x}{\cos x} - \frac{\cos x}{\sin x}}{\frac{\sin x \cos x}{1}}$

$\sin x \cos x \;\; \frac{\sin x \cos x}{1}$

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

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

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

$= \sec^2 x - \csc^2 x$

b. $\sin^2 B \tan B = \tan B - \sin B \cos B$

$= \frac{\sin B}{\cos B} - \frac{\sin B \cos B}{1} \cdot \frac{\cos B}{\cos B}$

$= \frac{\sin B - \sin B \cos^2 B}{\cos B}$

$= \frac{\sin B(1 - \cos^2 B)}{\cos B}$

$= \tan B \cdot \sin^2 B$

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c. $\dfrac{\cos A}{1-\sin^2 A} = \sec A$

$$\frac{\cos A}{\cos^2 A}$$

$$\frac{1}{\cos A}$$

$$\sec A$$

d. $\sec x - \tan x \sin x = \cos x$

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

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

$$\frac{\cos^2 x}{\cos x}$$

$$\cos x$$

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