Name HW KEY PreCalc

Group Work/Homework Unit 7 Day 4

NO CALCULATORS! You must use a formula for EVERY question.

Complete the formulas below:

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

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

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

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1. Simplify:

a. $\cos(A+\pi)$

$= \cos A\cos\pi - \sin A\sin\pi$

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

$= -\cos A$

b. $\sin\left(B - \frac{\pi}{2}\right)$

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

$= \sin B(0) - \cos B(1)$

$= -\cos B$

c. $\tan\left(x + \frac{\pi}{3}\right)$

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

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

d. $\sin\left(x + \frac{\pi}{2}\right) - \cos\left(x + \frac{3\pi}{2}\right)$

Aside $\sin\left(x+\frac{\pi}{2}\right) = \sin x\cos\frac{\pi}{2} + \cos x\sin\frac{\pi}{2}$

$= \sin x(0) + \cos x(1)$

$= \cos x$

$\cos\left(x+\frac{3\pi}{2}\right) = \cos x\cos\frac{3\pi}{2} - \sin x\sin\frac{3\pi}{2}$

$= \cos x(0) - \sin x(-1)$

$= \sin x$

$\therefore = \cos x - \sin x$

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2. Simplify. Find the exact value.

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

$\sin(x+y)$

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

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

$\cos(x-y)$

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

$=\cos\left(\frac{9\pi}{18}\right)=\cos\frac{1}{2}=0$

c. $\dfrac{\tan\left(\frac{\pi}{6}\right)+\tan\left(\frac{\pi}{12}\right)}{1-\tan\left(\frac{\pi}{6}\right)\tan\left(\frac{\pi}{12}\right)}$ $\tan(x+y)$

$=\tan\left(\frac{\pi}{6}+\frac{\pi}{12}\right)=\tan\left(\frac{2\pi}{12}+\frac{\pi}{12}\right)$

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

d. $\cos\left(\frac{13\pi}{12}\right)\cos\left(\frac{\pi}{4}\right)-\sin\left(\frac{13\pi}{12}\right)\sin\left(\frac{\pi}{4}\right)$

$\cos(x+y)$

$=\cos\left(\frac{13\pi}{12}+\frac{\pi}{4}\right)=\cos\left(\frac{13\pi}{12}+\frac{3\pi}{12}\right)$

$=\cos\left(\frac{16\pi}{12}\right)=\cos\left(\frac{4\pi}{3}\right)=-\frac{1}{2}$

e. $\sin\left(\frac{11\pi}{6}\right)\cos\left(\frac{2\pi}{3}\right)-\cos\left(\frac{11\pi}{6}\right)\sin\left(\frac{2\pi}{3}\right)$

$\sin(x-y)$

$\sin\left(\frac{11\pi}{6}-\frac{2\pi}{3}\right)=\sin\left(\frac{11\pi}{6}-\frac{4\pi}{6}\right)$

$=\sin\left(\frac{7\pi}{6}\right)=-\frac{1}{2}$

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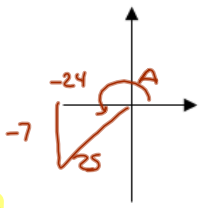
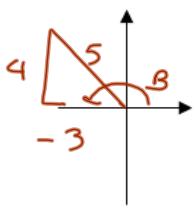
3. If $\sin A=-\frac{7}{25}$, $\pi\le A\le\frac{3\pi}{2}$, $\cos B=-\frac{3}{5}$, and B is in quadrant II, find each of the following: (you MUST draw triangles!)





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

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

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

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

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

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

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

$=\frac{72}{125}+\frac{28}{125}=\frac{100}{125}=\frac{4}{5}$

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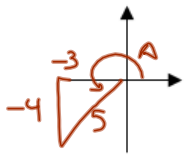
4. If $\cos A = -\frac{3}{5}$ and $\pi \le A \le \frac{3\pi}{2}$, find



a. $\sin 2A = 2\sin A\cos A$
$= 2\left(\frac{-4}{5}\right)\left(\frac{-3}{5}\right) = \frac{24}{25}$

b. $\sin \frac{1}{2}A = \sqrt{\frac{1-\cos A}{2}}$
$= \sqrt{\frac{1-\left(\frac{-3}{5}\right)}{2}} = \sqrt{\frac{5\cdot 1-\left(\frac{-3}{5}\right)5}{2\cdot 5}} = \sqrt{\frac{5+3}{10}}$
$= \sqrt{\frac{8}{10}} = \sqrt{\frac{4}{5}} = \frac{2}{\sqrt{5}} = \frac{2\sqrt{5}}{5}$

5. If $\sin A = \frac{1}{\sqrt{5}}$, find $\cos 2A$.

$\cos 2A = 1-2\sin^2 A$
$= 1-2\left(\frac{1}{\sqrt{5}}\right)^2 = 1-2\left(\frac{1}{5}\right)$
$= 1-\frac{2}{5} = \frac{3}{5}$

6. Find the exact value of $\cos\frac{\pi}{8}$

$\cos\left(\frac{1}{2}\cdot\frac{\pi}{4}\right) = \overset{Q1}{+}\sqrt{\frac{1+\cos\frac{\pi}{4}}{2}}$
$\cos\frac{\pi}{4} = \frac{\sqrt{2}}{2} = \sqrt{\frac{1+\frac{\sqrt{2}}{2}}{2}} = \sqrt{\frac{2\cdot 1+\sqrt{2}\cdot 2}{2\cdot 2}}$
$= \sqrt{\frac{2+\sqrt{2}}{4}} = \frac{\sqrt{2+\sqrt{2}}}{2}$

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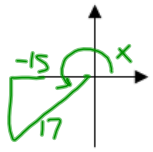
7. If $\tan x = \frac{8}{15}$ and $\pi < x < \frac{3\pi}{2}$, find each of the following:



a. $\sin 2x = 2\sin x\cos x$
$= 2\left(\frac{-8}{17}\right)\left(\frac{-15}{17}\right) = \frac{240}{289}$

b. $\cos 2x$ (Choose Any of the 3)
$= 1-2\sin^2 x = 1-2\left(\frac{-8}{17}\right)^2 = 1-2\left(\frac{64}{289}\right) = \frac{289}{289}-\frac{128}{289}$
$= \frac{161}{289}$

c. $\sin\frac{1}{2}x = \sqrt{\frac{1-\cos x}{2}}$
$= \sqrt{\frac{1-\left(\frac{-15}{17}\right)}{2}} = \sqrt{\frac{17(1)-\left(\frac{-15}{17}\right)17}{2\cdot 17}}$
$= \sqrt{\frac{17+15}{34}} = \sqrt{\frac{32}{34}} = \sqrt{\frac{16}{17}}$
$= \frac{4}{\sqrt{17}} = \frac{4\sqrt{17}}{17}$

d. $\cos\frac{1}{2}x$
$= -\sqrt{\frac{1+\left(\frac{-15}{17}\right)}{2}}$
$= -\sqrt{\frac{17(1)+\left(\frac{-15}{17}\right)17}{2(17)}} = -\sqrt{\frac{17-15}{34}}$
$= -\sqrt{\frac{2}{34}} = -\sqrt{\frac{1}{17}} = -\frac{1}{\sqrt{17}} = -\frac{\sqrt{17}}{17}$

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QUIZ

No Calculator

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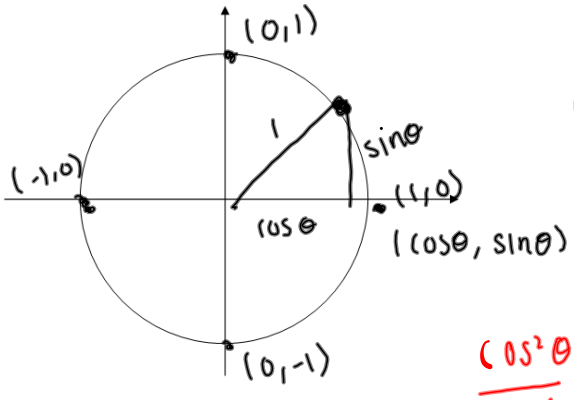
Pythagorean Identities

PreCalc
Unit 7 Day 5



$a^2 + b^2 = c^2$

$\cos^2\theta + \sin^2\theta = 1$

Basic Pythagorean Identities:

$\cos^2\theta + \sin^2\theta = 1$

$-\cos^2\theta \quad -\cos^2\theta$

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

$\cos^2\theta + \sin^2\theta = 1$

$-\sin^2\theta \quad -\sin^2\theta$

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

$\frac{\cos^2\theta}{\cos^2\theta} + \frac{\sin^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$

$1 + \tan^2\theta = \sec^2\theta$

$\frac{\cos^2\theta}{\sin^2\theta} + \frac{\sin^2\theta}{\sin^2\theta} = \frac{1}{\sin^2\theta}$

$\cot^2\theta + 1 = \csc^2\theta$

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Factor and simplify, if possible:

$x^2 - y^2$

1. $\sec^2\theta - \csc^2\theta$

$(\sec\theta - \csc\theta)(\sec\theta + \csc\theta)$

GCF $y + y^3$

2. $\tan x + \tan^3 x$

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

$\tan x(\sec^2 x)$

$(a^3 - b^3) = (a-b)(a^2 + ab + b^2)$

3. $\cos^3 x - 8$ $a: \cos x$ $b: 2$

$(\cos x - 2)(\cos^2 x + 2\cos x + 4)$

4. $\sin^4 x - \cos^4 x$

$(\sin^2 x - \cos^2 x)(\sin^2 x + \cos^2 x)$

$(\sin x - \cos x)(\sin x + \cos x)(\sin^2 x + \cos^2 x)$

$= 1$

$(\sin x - \cos x)(\sin x + \cos x)(1)$

$(\sin x - \cos x)(\sin x + \cos x)$

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Multiply and Simplify:

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

5. $(\sin\alpha - \cos\alpha)^2$

$(\sin\alpha - \cos\alpha)(\sin\alpha - \cos\alpha)$

$\sin^2\alpha - \cos\alpha\sin\alpha - \sin\alpha\cos\alpha + \cos^2\alpha$

$\sin^2\alpha - 2\cos\alpha\sin\alpha + \cos^2\alpha$

$1 - 2\cos\alpha\sin\alpha$

6. $(1 - \cos\theta)(1 + \cos\theta)$

$(1 - \cos^2\theta)$

$\sin^2\theta$

7. $\csc x(\cos x - \sin x)$

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

$\frac{\cos x - \sin x}{\sin x} = \cot x - 1$

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Simplify.

8. $\sin^2 x + \sin^2 x \tan^2 x$

$\sin^2 x (1 + \tan^2 x)$

$\sin^2 x (\sec^2 x)$

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

9. $\frac{1}{\sin^2\theta} - \frac{\cos^2\theta}{\sin^2\theta}$

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

10. $\sin\theta + \cot\theta\cos\theta$

$\sin\theta + \frac{\cos\theta}{\sin\theta}\cdot\frac{\cos\theta}{1}$

$\frac{\sin\theta}{\sin\theta}(\sin\theta) + \frac{\cos^2\theta}{\sin\theta}$

$\frac{\sin^2\theta}{\sin\theta} + \frac{\cos^2\theta}{\sin\theta} = \frac{\sin^2\theta + \cos^2\theta}{\sin\theta} = \frac{1}{\sin\theta} = \csc\theta$

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