

Worksheet 7.1

11. $\tan(5u)$

16. $-\frac{24}{25}$

12. $\sin(4x)$

17. $-\frac{3\sqrt{34}}{34}$

13. $\frac{\sqrt{2}}{2}$

18. $\frac{3\sqrt{10}}{10}$

14. $-\frac{\sqrt{3}}{3}$

19. $\sqrt{\frac{2-\sqrt{3}}{4}}$ or $\frac{\sqrt{2-\sqrt{3}}}{2}$

15. $-\frac{7\sqrt{2}}{10}$

20. a. $\frac{84}{85}$

b. $-\frac{77}{85}$

c. $\frac{84}{13}$

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Name _____

PreCalc

Group Work/Homework

Unit 7 Day 4

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

Complete the formulas below:

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

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

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

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

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

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

Jan 22-7:33 AM

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

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

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

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

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

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

$$= \cos x$$

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

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

$$= \sin x$$

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

Jan 22-7:35 AM

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

$$\cos(x-y)$$

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

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

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

$$\tan(x+y)$$

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

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

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

$$\sin(x-y)$$

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

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

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

$$\cos(x+y)$$

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

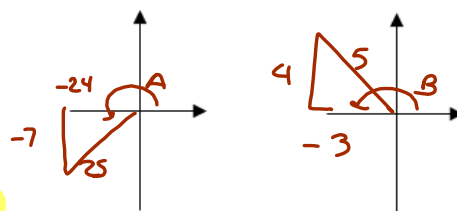
$$= \cos\left(\frac{16\pi}{12}\right) = \cos\left(\frac{4\pi}{3}\right) = -\frac{1}{2}$$

Jan 22-7:35 AM

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

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

$$= \frac{\frac{-24}{7} - \left(-\frac{4}{3}\right)}{1 + \left(\frac{-24}{7}\right)\left(-\frac{4}{3}\right)} = \frac{-\frac{24}{7} + \frac{4}{3}}{1 + \frac{32}{7}} = \frac{-\frac{24}{7} + \frac{4}{3}}{\frac{39}{7}} = \frac{-24 + \frac{4 \cdot 7}{3}}{39} = \frac{-24 + \frac{28}{3}}{39} = \frac{-\frac{72}{3} + \frac{28}{3}}{39} = \frac{-\frac{44}{3}}{39} = -\frac{44}{117}$$



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

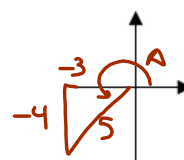
$$= \left(-\frac{24}{25}\right)\left(-\frac{3}{5}\right) - \left(-\frac{7}{25}\right)\left(\frac{4}{5}\right) = \frac{72}{125} + \frac{28}{125} = \frac{100}{125} = \frac{4}{5}$$

Jan 22-7:36 AM

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

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

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



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 $\cos \frac{\pi}{8}$

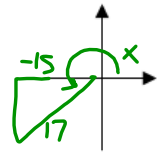
$$\cos\left(\frac{1}{2} \cdot \frac{\pi}{4}\right) = \sqrt{\frac{1 + \cos \frac{\pi}{4}}{2}} = \sqrt{\frac{1 + \frac{\sqrt{2}}{2}}{2}} = \sqrt{\frac{2 + \sqrt{2}}{4}} = \frac{\sqrt{2 + \sqrt{2}}}{2}$$

Jan 22-7:36 AM

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)
 $= 1 - 2 \sin^2 x = 1 - 2 \left(-\frac{8}{17}\right)^2 = 1 - 2 \left(\frac{64}{289}\right) = \frac{289}{289} - \frac{128}{289}$



c. $\sin \frac{1}{2}x = \sqrt{\frac{1 - \cos x}{2}}$

d. $\cos \frac{1}{2}x$

$= \sqrt{\frac{1 - \left(-\frac{15}{17}\right)}{2}} = \sqrt{\frac{17(1) - \left(-\frac{15}{17}\right)17}{2 \cdot 17}}$

$= -\sqrt{\frac{1 + \left(-\frac{15}{17}\right)}{2}}$

$= \sqrt{\frac{17+15}{34}} = \sqrt{\frac{32}{34}} = \sqrt{\frac{16}{17}}$

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

$= \frac{4}{\sqrt{17}} = \frac{4\sqrt{17}}{17}$

$= -\sqrt{\frac{2}{34}} = -\sqrt{\frac{1}{17}} = -\frac{1}{\sqrt{17}} = -\frac{\sqrt{17}}{17}$

Jan 22-7:37 AM

Jan 22-7:39 AM