5.3 Notes: Sum and Difference Formulas

$\sin(u+v) = \sin u \cos v + \cos u \sin v$ $\qquad tan\,(u+v) = \frac{tan\,u + tan\,v}{1 - tan\,u\,tan\,v}$

$\sin(u-v) = \sin u \cos v - \cos u \sin v$

$\cos(u+v) = \cos u \cos v - \sin u \sin v$ $\qquad tan\,(u-v) = \frac{tan\,u - tan\,v}{1 + tan\,u\,tan\,v}$

$\cos(u-v) = \cos u \cos v + \sin u \sin v$

Investigation:

1. A) Do you think the following expressions equivalent?

$$cos\,(\frac{\pi}{4} + \frac{\pi}{3}) \qquad\qquad cos\,\frac{\pi}{4} + cos\,\frac{\pi}{3}$$

B) Find the exact value of $cos\,(\frac{\pi}{4} + \frac{\pi}{3})$ using a sum identity from above.

C) Find the exact value of $cos\,\frac{\pi}{4} + cos\,\frac{\pi}{3}$

D) Are the two expressions above equivalent?

2. Break up the following angle into the sum or difference of two angles on the unit circle

$\frac{5\pi}{12} =$

Ex: 1 Find the exact value of: **a.)** $sin\ \frac{5\pi}{12}$ **b.)** $tan\ \frac{5\pi}{12}$

You try: find the exact values of $cos\ \frac{5\pi}{12}$

Ex: 2 Find the exact value of **a.)** sin 195° **b.)** cos 195°

You try: find the exact value of tan 195°

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Ex: 3 Find the exact value of: **a.)** $\sin\frac{\pi}{12}$ **b.)** $\tan\frac{\pi}{12}$

You try: Find the exact value of $\cos\frac{\pi}{12}$**.**

Ex: 4 Find the exact value of: **a.)** $\cos 75^\circ$ **b.)** $\tan 75^\circ$

You try: Find the exact value of $\sin 75^\circ$**.**

Ex: 5 Find the exact value of $\sin(u+v)$ **given** $\sin u = \frac{4}{5}$**, where** $0 < u < \frac{\pi}{2}$**, and** $\cos v = -\frac{12}{13}$**, where** $\frac{\pi}{2} < v < \pi$**.**

You Try: Find the exact value of $\cos(u+v)$ **given** $\sin u = \frac{7}{25}$**, where** $0 < u < \frac{\pi}{2}$**, and** $\cos v = -\frac{4}{5}$**, where** $\frac{\pi}{2} < v < \pi$**.**

Ex: 6 a.) Use a difference formula to prove the cofunction identity $\cos\left(\frac{\pi}{2} - x\right) = \sin x$ **.**

b.) Prove the identity $\tan(x - \pi) = \tan x$

You Try: Use a difference formula to prove the cofunction identity $\sin\left(x - \frac{\pi}{2}\right) = -\cos x$ **.**

Ex: 7 Simplify each expression a.) $\cos\left(\theta - \frac{3\pi}{2}\right)$ **b.)** $\tan(\theta + 3\pi)$

You Try: Simplify the expression $\sin(5\pi - \theta)$**.**