SM 3H

**Date:** 4/10/24 **Section:** 8.4

**Objective:** I can use sum and difference of sine and tangent identities.

What we did with cosine can also be done with sine and tangent.

**Sum and Difference of Sine**

$\sin(\alpha+\beta) =$ $\sin\alpha\cos\beta + \cos\alpha\sin\beta$

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

$\sin(\alpha\pm\beta) =$ $\sin\alpha\cos\beta \pm \cos\alpha\sin\beta$

Mnemonic Device:

Sine can't change signs

**Sum and Difference of Tangent**

$\tan(\alpha+\beta) =$ $\dfrac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$

$\tan(\alpha-\beta) =$ $\dfrac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$

$\tan(\alpha\pm\beta) =$ $\dfrac{\tan\alpha\pm\tan\beta}{1\mp\tan\alpha\tan\beta}$

Mnemonic Device:

you tan and you tan then roll over 1 time and tan some more

Examples:

1. Find the exact value of $\sin 75°$.

$\sin(45°+30°)$

$\sin45°\cos30° + \cos45°\sin30°$

$\frac{\sqrt{2}}{2}\cdot\frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2}\cdot\frac{1}{2}$

$\dfrac{\sqrt{6}+\sqrt{2}}{4}$

2. Find the exact value of $\tan\frac{5\pi}{12}$.

$\tan\left(\frac{\pi}{4}+\frac{\pi}{6}\right)$

$\dfrac{\tan\frac{\pi}{4}+\tan\frac{\pi}{6}}{1-\tan\frac{\pi}{4}\tan\frac{\pi}{6}}$

$\dfrac{1+\frac{1}{\sqrt{3}}}{1-1\cdot\frac{1}{\sqrt{3}}}$

$\dfrac{\frac{\sqrt{3}+1}{\sqrt{3}}}{\frac{\sqrt{3}-1}{\sqrt{3}}} = \dfrac{\sqrt{3}+1}{\sqrt{3}-1}$

Using the appropriate trig identity, simplify.

1. $\sin\frac{\pi}{12}\cos\frac{5\pi}{18} - \cos\frac{\pi}{12}\sin\frac{5\pi}{18}$

$\sin\left(\frac{\pi}{12}-\frac{5\pi}{18}\right)$

$\frac{1\cdot3}{12\cdot3}\quad\frac{5\cdot2}{18\cdot2}$

$3-10$

$\sin\left(-\frac{7\pi}{36}\right)$

OR

$-\sin\left(\frac{7\pi}{36}\right)$

2. $\dfrac{\tan58°+\tan31°}{1-\tan58°\tan31°}$

$\tan(58°+31°)$

$\tan(89°)$

Examples: Find the exact values of the given trig function.

1. Find the exact value of $\sin(\alpha+\beta)$ if $\sin\alpha = -\frac{3}{5}$ and $\cos\beta = -\frac{1}{13}$. $\alpha$ is in Quadrant IV. $\beta$ is in Quadrant III.