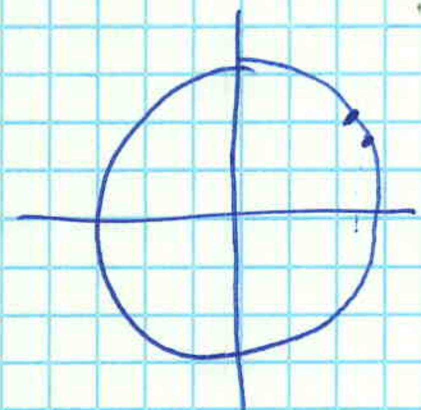
2-23-15

5-4-1 Use Sum and Difference Identities

Ex 1 Solve by rewriting the angle as a sum or difference

a) $\sin 15^\circ = \sin(\underset{\alpha}{45^\circ} - \underset{\beta}{30^\circ})$

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



$= \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ$

$\left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{3}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{1}{2}\right)$

$\frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}$ OR $\boxed{\frac{\sqrt{6}-\sqrt{2}}{4}}$

b) $\tan\left(\frac{7\pi}{12}\right) = \tan\left(\frac{3\pi}{12} + \frac{4\pi}{12}\right) = \tan\left(\underset{\alpha}{\frac{\pi}{4}} + \underset{\beta}{\frac{\pi}{3}}\right)$

$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta} = \frac{\tan\frac{\pi}{4} + \tan\frac{\pi}{3}}{1 - \tan\frac{\pi}{4}\tan\frac{\pi}{3}}$

$\tan\frac{\pi}{4} = 1 \quad \tan\frac{\pi}{3} = \sqrt{3}$ $\quad \frac{1+\sqrt{3}}{1 - 1\sqrt{3}}$

(from Unit Circle)

$\frac{(1+\sqrt{3})}{(1-\sqrt{3})} \cdot \frac{(1+\sqrt{3})}{(1+\sqrt{3})} = \frac{1 + 2\sqrt{3} + 3}{1-3} = \frac{4 + 2\sqrt{3}}{-2}$

$\tan\frac{7\pi}{12} = \boxed{-2 - \sqrt{3}}$

* Separate angle into the sum or difference of known angles.
* Use sum / difference Identities

EX 3 Reduce using the Sum or Difference Identi

solve a) $\frac{\tan 32° + \tan 13°}{1 - \tan 32° \tan 13°}$ sum tangent angles

$\tan(32° + 13°) = \boxed{\tan 45° = 1}$

b) $\sin x \sin 3x - \cos x \cos 3x$

$-1(\cos x \cos 3x - \sin x \sin 3x)$

factor out -1 to switch order

cosine sum formula

$(-1)\cos(x + 3x) = \boxed{-\cos 4x}$

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