$$\sin 2x - \sin x = 0$$

$$2\sin x \cos x - \sin x = 0$$

$$\sin x (2\cos x - 1) = 0$$

$$\sin x = 0 \qquad 2\cos x - 1 = 0$$

$0, \pi, 2\pi \ldots$

$$\cos x = \frac{1}{2}$$

$n \cdot \pi$

$\pi/3 + 2\pi(n) \qquad \frac{5\pi}{3} + 2\pi(n)$

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

$$6\sin x\cos x = 3\left(\underline{2\sin x\cos x}\right) = 3\sin 2x$$

Half Angles!

ALL DERIVE FROM $\cos(2x)$

$$\cos\left(\cancel{2}\left(\frac{x}{\cancel{2}}\right)\right) = 2\cos^2\left(\frac{x}{2}\right) - 1$$

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

$$+1 \qquad\qquad +1$$

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

$$\sqrt{\cos^2\left(\frac{x}{2}\right)} = \sqrt{\frac{1+\cos x}{2}}$$

$$\boxed{\cos\left(\frac{x}{2}\right) = \pm\sqrt{\frac{1+\cos x}{2}}}$$

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

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

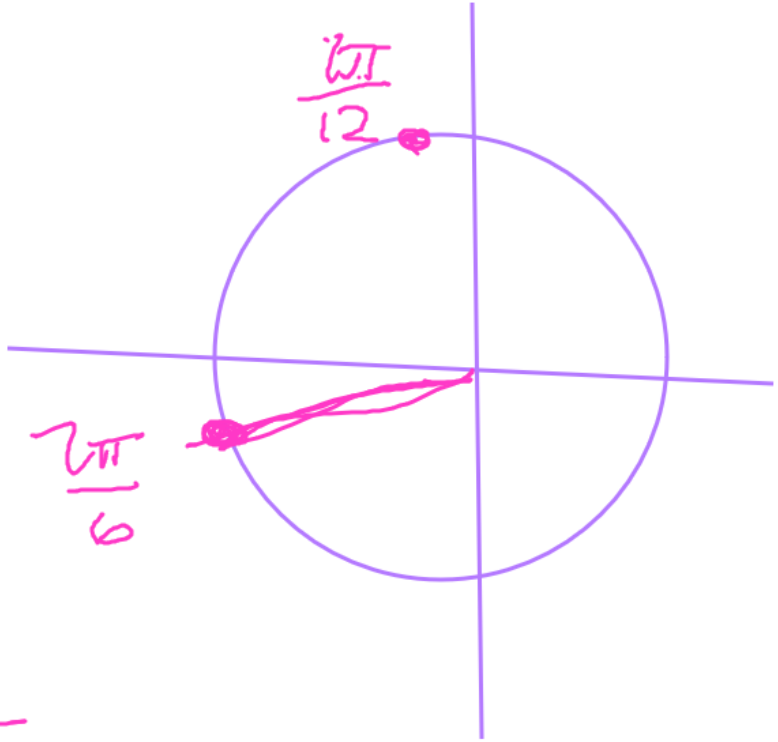
$$\frac{\cancel{2}\sin^2\left(\frac{x}{2}\right)}{\cancel{2}} = \frac{1 - \cos x}{2}$$

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

$$\boxed{\sin\left(\frac{x}{2}\right) = \pm\sqrt{\frac{1-\cos x}{2}}}$$

Pos Neg

$$\sin\left(\frac{7\pi}{12}\right) = \sin\left(\frac{7\pi/6}{2}\right)$$



$$+\sqrt{\frac{1-\cos\left(\frac{7\pi}{6}\right)}{2}}$$

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

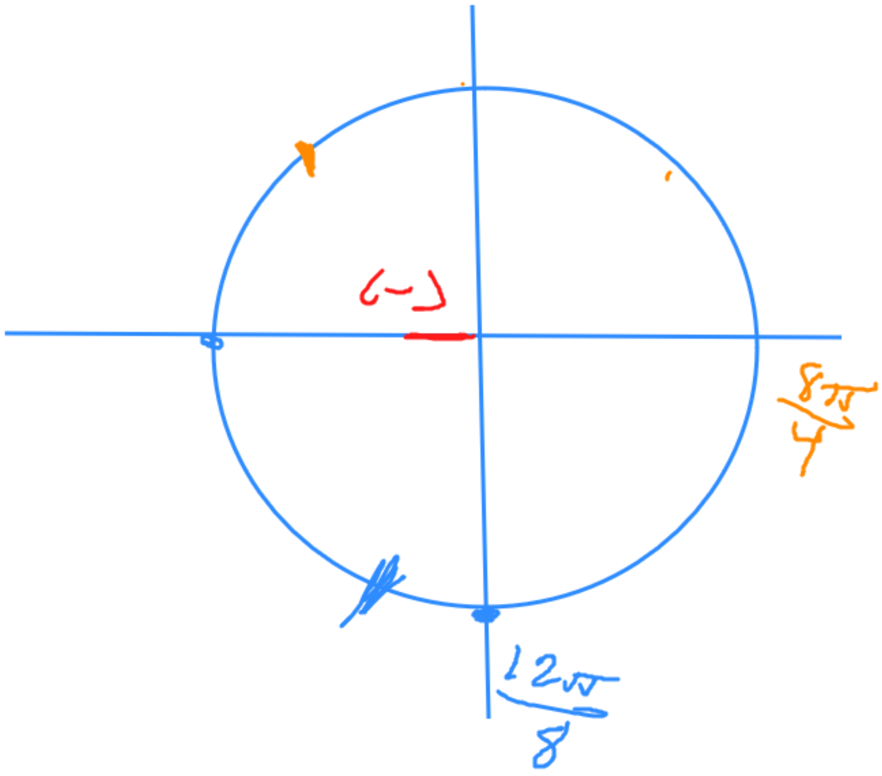
$$\approx .966$$

$$\cos\left(\frac{11\pi}{8}\right) = \cos\left(\frac{\frac{11\pi}{4}}{2}\right) \quad (-)$$

$$-\sqrt{\frac{1+\cos\frac{11\pi}{4}}{2}}$$

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

$$-.3827$$



$$\tan\left(\frac{x}{2}\right) = \frac{\sin\left(\frac{x}{2}\right)}{\cos\left(\frac{x}{2}\right)} = \frac{\pm\sqrt{\frac{1-\cos x}{2}}}{\pm\sqrt{\frac{1+\cos x}{2}}} = \frac{\sqrt{1-\cos x}}{\sqrt{1+\cos x}}$$

$$\frac{\sqrt{1-\cos x}}{\sqrt{1+\cos x}} \cdot \frac{\sqrt{1+\cos x}}{\sqrt{1+\cos x}} = \frac{\sqrt{(1-\cos x)(1+\cos x)}}{1+\cos x} = \frac{\sqrt{1-\cos^2 x}}{} = \sqrt{\sin^2 x}$$

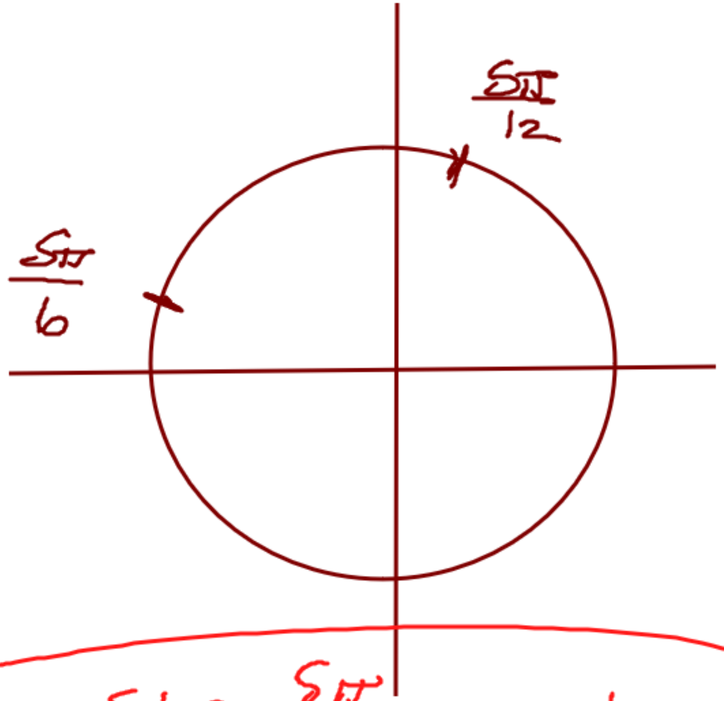
$$= \boxed{\frac{\sin x}{1+\cos x}}$$

$$\frac{\sqrt{1-\cos x}}{\sqrt{1+\cos x}} \cdot \frac{\sqrt{1-\cos x}}{\sqrt{1-\cos x}} = \frac{1-\cos x}{\sin x}$$

$$\sqrt{1-\cos^2 x}$$

$$\sqrt{\sin^2 x}$$

$$\tan\left(\frac{5\pi}{12}\right) = \tan\left(\frac{\frac{5\pi}{6}}{2}\right) =$$



$$\frac{1-\cos\left(\frac{5\pi}{6}\right)}{\sin\left(\frac{5\pi}{6}\right)} = \frac{1-\left(-\frac{\sqrt{3}}{2}\right)}{\frac{1}{2}}$$

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

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

$$\frac{\sin\frac{5\pi}{6}}{1+\cos\left(\frac{5\pi}{6}\right)} = \frac{\frac{1}{2}}{1-\frac{\sqrt{3}}{2}}$$

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

5.5B KUTA Double-Half

[BREAK]

5.5.C Lesson 4/13

11:30

55D Lesson 4/14

16- Review

55E Review 4/15

Test Due 4/20