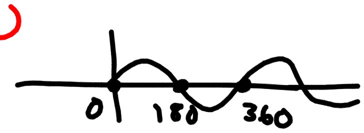
# TRIG IDENTITIES

① Exact values, non-permissible values
② The whole Enchilada

NPV's (non-permissible values or restrictions)

Ex 6.1 $\frac{\cos x}{\sin x}$ → $\sin x \neq 0$




OR $x \neq 0 + 180n \quad n \in I$

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

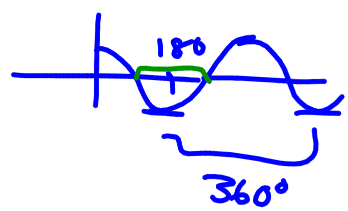
NPV: $\cos x \neq 0$

so $x \neq 90 + 180n$

or $\cos x \neq -1$

or $x \neq 180 + 360n$

$n \in I$




Rewrite in terms of sinx, cosx, tanx

$$\sec x \cot x \sin^2 x = \sin x$$

$$\frac{1}{\cancel{\cos x}} \cdot \frac{\cancel{\cos x}}{\cancel{\sin x}} \cdot \frac{\sin^{\cancel{2}} x}{1} = \sin x$$

6.2

① Write as a single $f^{\underline{n}}$:

$\overset{A}{\underline{\cos}}\,37\,\overset{B}{\underline{\cos}}\,28 - \overset{A}{\underline{\sin}}\,37\,\overset{B}{\underline{\sin}}\,28$

#10 $\cos(A+B) = \underline{\cos}A\underline{\cos}B - \sin A\sin B$

$\cos(37+28) = \cos 65$

② What is the Exact value:

$\underline{\cos}\,\overset{A}{20}\,\underline{\sin}\,\overset{B}{25} + \underline{\sin}\,\overset{A}{20}\,\underline{\cos}\,\overset{B}{25}$

$= \sin(20+25)$

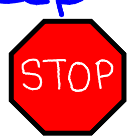
$= \sin 45$

$= \frac{1}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

6.3

# TRIG IDENTITIES

## Tricks of the trade:

1. write everything in terms of sin θ and cos θ (99.9% of the time!) and start on the most complicated side
2. Do NOT move things across the Great Wall of China
3. Keep your  on the prize... what are you trying to prove?!
4. If things keep getting messier and messier, 

and start again.
5. Remember your fraction skills (common denom., invert & mult...)
6. watch for difference of squares and conjugate pairs. Factor & kill!

$$\frac{1 - \cos 2x}{\sin 2x} = \tan x$$

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

$$\frac{\cancel{1 - 1}^{0} + 2\sin^2 x}{2\sin x\cos x}$$

$$\frac{\cancel{2}\sin^{\cancel{2}} x}{\cancel{2}\,\cancel{\sin x}\cos x}$$

$$\frac{\sin x}{\cos x} = \tan x = \tan x$$

LS = RS

QED

$$\frac{1-\cos x}{\sin x} \neq \frac{\sin x}{1+\cos x}$$

$$\frac{(1-\cos x)}{\sin x} \cdot \frac{(1+\cos x)}{(1+\cos x)}$$

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

6

$$\frac{\sin^{\cancel{2}} x}{\cancel{\sin x}(1+\cos x)}$$

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

LS = RS

$$\cot x - \csc x = \frac{\cos 2x - \cos x}{\sin 2x + \sin x}$$

$$\frac{\cos x}{\sin x} - \frac{1}{\sin x}$$

$$\frac{\cos x - 1}{\sin x}$$

(17)

$$\frac{2\cos^2 x - 1 - \cos x}{2\sin x\cos x + \sin x}$$

$$\frac{2\cos^2 x - \cos x - 1}{\sin x\,(2\cos x + 1)}$$

$$\frac{\cancel{(2\cos x+1)}(\cos x - 1)}{\sin x\,\cancel{(2\cos x + 1)}}$$

$$\frac{\cos x - 1}{\sin x}$$

$$\frac{\cos x}{\sin x} - \frac{1}{\sin x}$$

$$\cot x - \csc x$$

15

$$\frac{\tan x + \sin x}{1 + \cos x} = \frac{1}{\csc 2x} - \frac{\tan x}{\sec 2x}$$

$$\frac{\frac{\sin x}{\cos x} + \frac{\sin x}{1} \cdot \frac{\cos x}{\cos x}}{1 + \cos x}$$

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

$$\frac{\frac{\sin x(1 + \cos x)}{\cos x}}{\frac{(1 + \cos x)}{1}}$$

$$\frac{\sin x \cancel{(1+\cos x)}}{\cos x} \cdot \frac{1}{\cancel{(1+\cos x)}}$$

$$\tan x$$

$$\sin 2x - \tan x \cdot \cos 2x$$

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

$$2\sin x \cos x - \frac{2\sin x \cos^2 x}{\cos x} + \frac{\sin x}{\cos x}$$

$$\cancel{2\sin x \cos x} - \cancel{2\sin x \cos x} + \tan x$$

$$\tan x$$

LS = RS phewf!