PreCalculus Trig ID Handout – *OK for Homework and Tests*

5.1 Pythagorean Identities

$\sin^2 x + \cos^2 x = 1$

$1 + \tan^2 x = sec^2 x$

$\cot^2 x + 1 = \csc^2 x$

5.1 Co-function Identities

$\sin\left(\frac{\pi}{2} - \theta\right) = \cos(\theta)$ $\quad$ $\cos\left(\frac{\pi}{2} - \theta\right) = \sin(\theta)$

$\tan\left(\frac{\pi}{2} - \theta\right) = \cot(\theta)$ $\quad$ $\cot\left(\frac{\pi}{2} - \theta\right) = \tan(\theta)$

$\sec\left(\frac{\pi}{2} - \theta\right) = \csc(\theta)$ $\quad$ $\csc\left(\frac{\pi}{2} - \theta\right) = \sec(\theta)$

5.1 Odd-Even Identities

$\sin(-\theta) = -\sin(\theta)$ $\quad$ $\cos(-\theta) = \cos(\theta)$ $\quad$ $\tan(-\theta) = -\tan(\theta)$

$\csc(-\theta) = -\csc(\theta)$ $\quad$ $\sec(-\theta) = \sec(\theta)$ $\quad$ $\cot(-\theta) = -\cot(\theta)$

5.3 Sum and Difference Identities

$\sin(u \pm v) = \sin u \cdot \cos v \pm \cos u \cdot \sin v$

Note: sign does *not* switch

$\cos(u \pm v) = \cos u \cdot cosv \mp \sin u \cdot \sin v$

Note: sign *does* switch!

$\tan(u \pm v) = \frac{\sin(u \pm v)}{\cos(u \pm v)}$ OR $\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u \tan v}$

Note: sign switches in denominator only!

5.4 Double-Angle Identities

$\sin 2u = 2 \sin u \cdot \cos u$

$\cos 2u = cos^2 u - sin^2 u$ OR $2cos^2 u - 1$ OR $1 - 2 sin^2 u$

$\tan 2u = \frac{2 \sin u \cos u}{cos^2 u - sin^2 u}$ OR $\frac{2 \tan u}{1 - tan^2 u}$

5.4 Power-Reducing Identities

$\sin^2 u = \frac{1 - \cos 2u}{2}$ $\quad$ $\cos^2 u = \frac{1 + \cos 2u}{2}$ $\quad$ $\tan^2 u = \frac{1 - \cos 2u}{1 + \cos 2u}$

5.4 Half-Angle Identities

$\sin\frac{u}{2} = \pm\sqrt{\frac{1 - \cos u}{2}}$ $\quad$ $\cos\frac{u}{2} = \pm\sqrt{\frac{1 + \cos u}{2}}$ $\quad$ $\tan\frac{u}{2} = \pm\sqrt{\frac{1 - \cos u}{1 + \cos u}}$ OR $\frac{1 - \cos u}{\sin u}$ OR $\frac{\sin u}{1 + \cos u}$

5.5 Law of Sines

$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

5.6 Law of Cosines

$a^2 = b^2 + c^2 - 2bc \cos(A)$

$b^2 = a^2 + c^2 - 2ac \cos(B)$

$c^2 = a^2 + b^2 - 2ab \cos(C)$