MAT 122 Cheat Sheet

Double-Angle Formulas: $\sin(2u)=2\sin(u)\cos(u)$, $\cos(2u)=\cos^2(u)-\sin^2(u)=2\cos^2(u)-1=1-2\sin^2(u)$,

$\tan(2u)=\dfrac{2\tan(u)}{1-\tan^2(u)}=\dfrac{\sin(2u)}{\cos(2u)}$!

Half-Angle Formulas: $\sin\left(\dfrac{u}{2}\right)=\pm\sqrt{\dfrac{1-\cos(u)}{2}}$, $\cos\left(\dfrac{u}{2}\right)=\pm\sqrt{\dfrac{1+\cos(u)}{2}}$, $\tan\left(\dfrac{u}{2}\right)=\dfrac{1-\cos(u)}{\sin(u)}=\dfrac{\sin\left(\frac{u}{2}\right)}{\cos\left(\frac{u}{2}\right)}$!!!`

You have to determine the "$\pm$" by determining the quadrant in which $\dfrac{u}{2}$ resides.

Power-Reducing Formulas:

Product-to-Sum Formulas

$\sin u \sin v = \frac{1}{2}[\cos(u-v)-\cos(u+v)]$

$\cos u \cos v = \frac{1}{2}[\cos(u-v)+\cos(u+v)]$

$\sin u \cos v = \frac{1}{2}[\sin(u+v)+\sin(u-v)]$

Sum-to-Product Formulas

$\sin u + \sin v = 2\sin\left(\frac{u+v}{2}\right)\cos\left(\frac{u-v}{2}\right)$

$\cos u + \cos v = 2\cos\left(\frac{u+v}{2}\right)\cos\left(\frac{u-v}{2}\right)$

$\cos u - \cos v = -2\sin\left(\frac{u+v}{2}\right)\sin\left(\frac{u-v}{2}\right)$

$\sin^2(u)=\dfrac{1-\cos(2u)}{2}$, $\cos^2(u)=\dfrac{1+\cos(2u)}{2}$, $\tan^2(u)=\dfrac{1-\cos(2u)}{1+\cos(2u)}=\dfrac{\sin^2(u)}{\cos^2(u)}$

Angle Sum Formulas

Pythagorean Identities

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

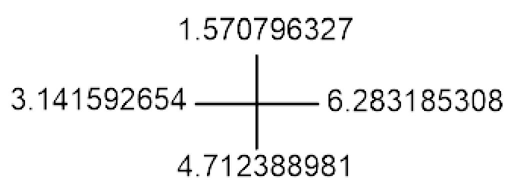
$\cot^2(x)+1=\csc^2(x)$

$\sin(u+v)=\sin(u)\cos(v)+\sin(v)\cos(u)$

$\cos(u+v)=\cos(u)\cos(v)-\sin(u)\sin(v)$

$\tan(u+v)=\dfrac{\tan(u)+\tan(v)}{1-\tan(u)\tan(v)}$

Radians without π



Law of Sines $\dfrac{\sin A}{a}=\dfrac{\sin B}{b}=\dfrac{\sin C}{c}$ **Law of Cosines** $a^2=b^2+c^2-2bc\cos A$

Heron's $Area=\sqrt{s(s-a)(s-b)(s-c)}$, where $s=\dfrac{a+b+c}{2}$. **Arc Length:** $s=r\theta$, **Area of a Sector:** $A=\dfrac{1}{2}r^2\theta$

Vector magnitude, dot product and projections from Chapter 3:

$\overline{u}=\langle a,b\rangle$ and $\overline{v}=\langle c,d\rangle \Rightarrow \overline{u}\bullet\overline{v}=ac+bd$, $\overline{u}=\langle a,b\rangle \Rightarrow \|\overline{u}\|=\sqrt{a^2+b^2}=\sqrt{\overline{u}\bullet\overline{u}}$, $\cos(\theta)=\dfrac{\overline{u}\bullet\overline{v}}{\|\overline{u}\|\,\|\overline{v}\|}$,

$proj_{\overline{v}}\overline{u}=\left(\dfrac{\overline{u}\bullet\overline{v}}{\|\overline{v}\|^2}\right)\overline{v}$