MAT 122 Cheat Sheet

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

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

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 determine "$\pm$" deal, by determining the quadrant in which $\dfrac{u}{2}$ resides.

Product-to-Sum Formulas

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

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

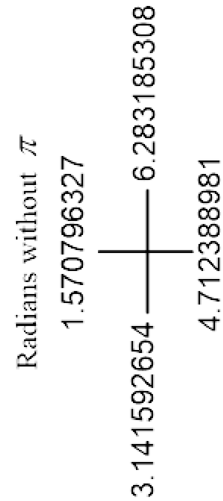
$\sin u\cos v=\dfrac{1}{2}[\sin(u+v)+\sin(u-v)]$

Sum-to-Product Formulas

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

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

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



Pythagorean Identities

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

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

Angle Sum Formulas

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

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

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 $s=\dfrac{a+b+c}{2}$. **Length:** $s=r\theta$, **Area:** $A=\dfrac{1}{2}r^2\theta$.

Vectors: $\bar{u}=\langle a,b\rangle\Rightarrow\|\bar{u}\|=\sqrt{\bar{u}\bullet\bar{u}}=\sqrt{a^2+b^2}$ $\quad\bar{u}=\langle u_1,u_2\rangle$ *and* $\bar{v}=\langle v_1,v_2\rangle\Rightarrow\bar{u}\bullet\bar{v}=u_1v_1+u_2v_2$ $\quad\cos\theta=\dfrac{\bar{u}\bullet\bar{v}}{\|\bar{u}\|\|\bar{v}\|}$

$proj_{\bar{v}}\bar{u}=\dfrac{\bar{u}\bullet\bar{v}}{\|\bar{v}\|^2}\bar{v}$

Complex #s $z=a+bi\Rightarrow\bar{z}=a-bi$

$$z^n=r^n(\cos(n\theta)+i\sin(n\theta))$$

$$z^{\frac{1}{n}}=\sqrt[n]{r}\left(\cos\left(\frac{\theta+2k\pi}{n}\right)+i\sin\left(\frac{\theta+2k\pi}{n}\right)\right),\ k=0,1,2,\ldots n-1$$

$$r_1(\cos\theta+i\sin\theta)\cdot r_2(\cos\phi+i\sin\phi)=r_1r_2(\cos(\theta+\phi)+i\sin(\theta+\phi))$$