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

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

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

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

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

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

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

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Radians without π

1.570796327

3.141592654 —— 6.283185308

4.712388981

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 $s = \dfrac{a + b + c}{2}$.

Arc Length: $s = r\theta$, **Area of a Sector:** $A = \dfrac{1}{2}r^2\theta$.

Dot Product-Related Items: $\bar{u} = \langle u_1, u_2 \rangle$ and $\bar{v} = \langle v_1, v_2 \rangle \Rightarrow \bar{u} \bullet \bar{v} = u_1 v_1 + u_2 v_2$

$\bar{u} = \langle a, b \rangle \Rightarrow \|\bar{u}\| = \sqrt{\bar{u} \bullet \bar{u}} = \sqrt{a^2 + b^2}$ $\cos\theta = \dfrac{\bar{u} \bullet \bar{v}}{\|\bar{u}\|\|\bar{v}\|}$ $proj_{\bar{v}}\bar{u} = \dfrac{\bar{u} \bullet \bar{v}}{\|\bar{v}\|^2}\bar{v}$