Double Angles Formulas

$\sin(2A) = 2\sin(A)\cos(A)$

$\cos(2A) = \cos^2(A) - \sin^2(A)$ → $\sin^2(A) + \cos^2(A) = 1$

$= 1 - 2\sin^2(A)$

$= 2\cos^2(A) - 1$

$\tan(2A) = \dfrac{2\tan(A)}{1 - \tan^2(A)}$

HALF ANGLES

$\sin\frac{u}{2} = \pm\sqrt{\frac{1-\cos u}{2}}$

$\cos\frac{u}{2} = \pm\sqrt{\frac{1-\cos u}{2}}$

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

Practice

$\theta = \frac{-12}{15}$

$\tan(2\theta) = \dfrac{2\tan(\theta)}{1-\tan^2(\theta)}$

$\tan\left(2\frac{-12}{15}\right) = \dfrac{2\left(\frac{-12}{15}\right)}{1-\left(\frac{-12}{15}\right)^2}$

$\tan\left(\frac{-24}{5}\right) = \dfrac{\frac{-24}{5}}{1-\left(\frac{144}{25}\right)}$

$\frac{-24}{5} = \dfrac{\frac{-24}{5}}{\frac{25}{25} - \frac{144}{25}}$

$= \dfrac{\frac{-24}{5}}{\frac{-119}{25}}$

$= \dfrac{-4.8}{-4.76}$

$= 1$

ex.

$\sin(15°) = \pm\sqrt{\dfrac{1-\cos(30°)}{2}}$

$\sin\left(\frac{u}{2}\right) = \sqrt{\dfrac{1-\frac{\sqrt{3}}{2}}{2}}$

$\left(\frac{u}{2}\right) = (15)^2 = \sqrt{\dfrac{0.134}{2}}$

$u = 30$

$= 0.2588$

PreCalculus HW 5.5

Find the exact solutions of the equations over the interval $[0, 2\pi)$

14. $\sin 2x - \sin x = 0$

21. $4\sin x \cos x = 1$ → $\sin 2A = 2\sin(A)\cos(A)$

$2(2\sin x \cos x) = 1$

$\frac{2(\sin 2x)}{2} = \frac{1}{2}$

$\sin^{-1}(\sin 2x) = \left(\frac{1}{2}\right)\sin^{-1}$

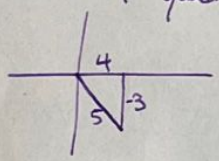
$\frac{2x}{2} = \frac{\pi}{6}/2, \frac{11\pi}{6}/2$

$x = \frac{\pi}{12}, \frac{11\pi}{12}$

Find the exact values of $\sin 2u$, $\cos 2u$, and $\tan 2u$.

37. $\sin u = \frac{-3}{5}$, $\frac{3\pi}{2} < u < 2\pi$ (4th quadrant.)

- make a triangle.
  special 3,4,5 triangle
- find $\cos u$ and $\tan u$.
- plug into the formulas.



$\sin 2u = 2\sin(u)\cos(u)$

$\cos 2u = \cos^2(u) - \sin^2(u)$

$\tan 2u = \frac{2\tan(u)}{1 - \tan^2(u)}$

$\sin 2u = 2\left(\frac{-3}{5}\right)\left(\frac{4}{5}\right)$

$\sin 2u = \frac{-24}{25}$

41. $\sec u = -2$, $\frac{\pi}{2} < u < \pi$

Find the exact values of $\sin\frac{u}{2}$, $\cos\frac{u}{2}$, $\tan\frac{u}{2}$

67. $\cos u = \frac{7}{25}$, $0 < u < \frac{\pi}{2}$

71. $\csc u = \frac{-5}{3}$, $\pi < u < \frac{3\pi}{2}$