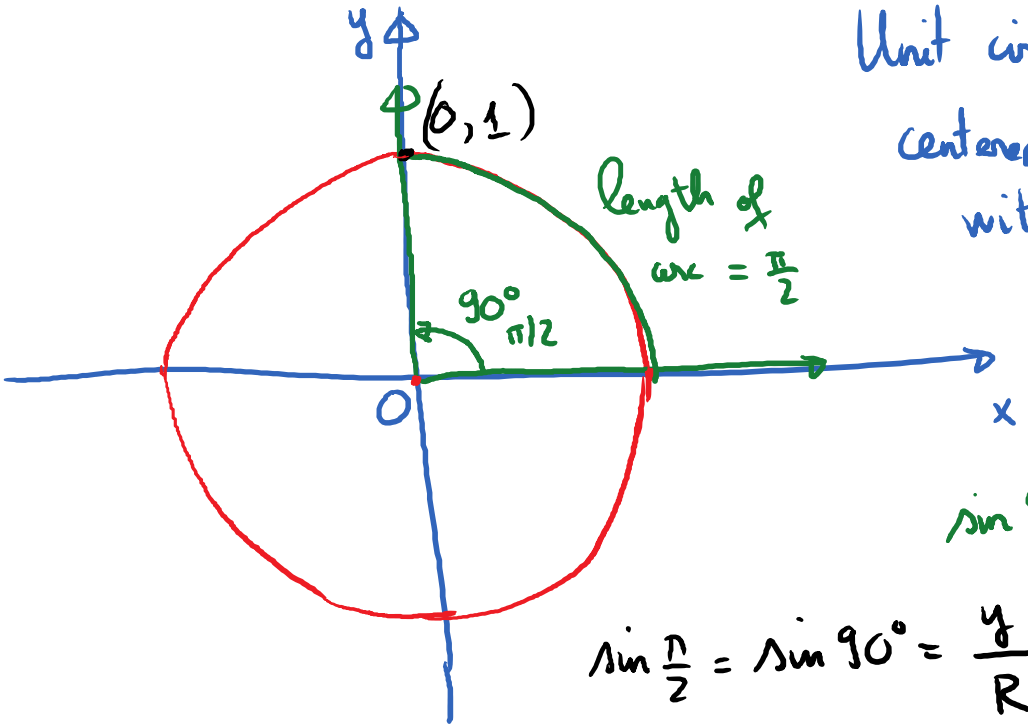
3.3. The unit Circle and Circular Functions

Wednesday, October 4, 2017 9:59 AM



Unit circle is a circle centered at the origin with radius = 1.

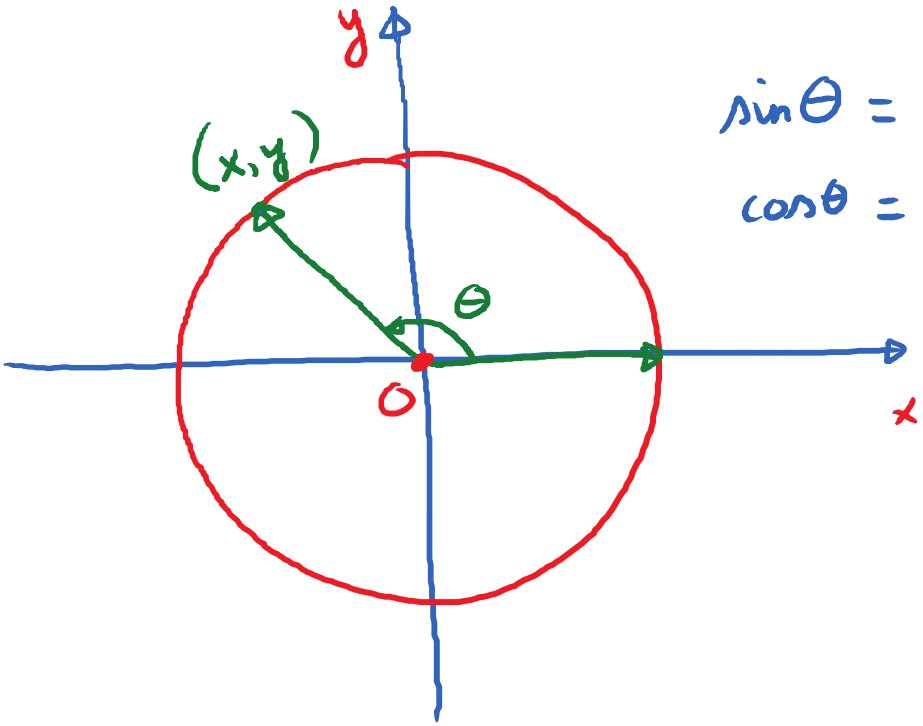
$\sin 90° = \sin \frac{\pi}{2}$

$\sin \frac{\pi}{2} = \sin 90° = \frac{y}{R} = y = 1$

$\cos 90° = \cos \frac{\pi}{2} = x = 0$

Unit circle

Wednesday, October 4, 2017 10:08 AM



$\sin\theta = y$

$\cos\theta = x$

$\tan\theta = \frac{y}{x}$

$\sec\theta = \frac{1}{x}$

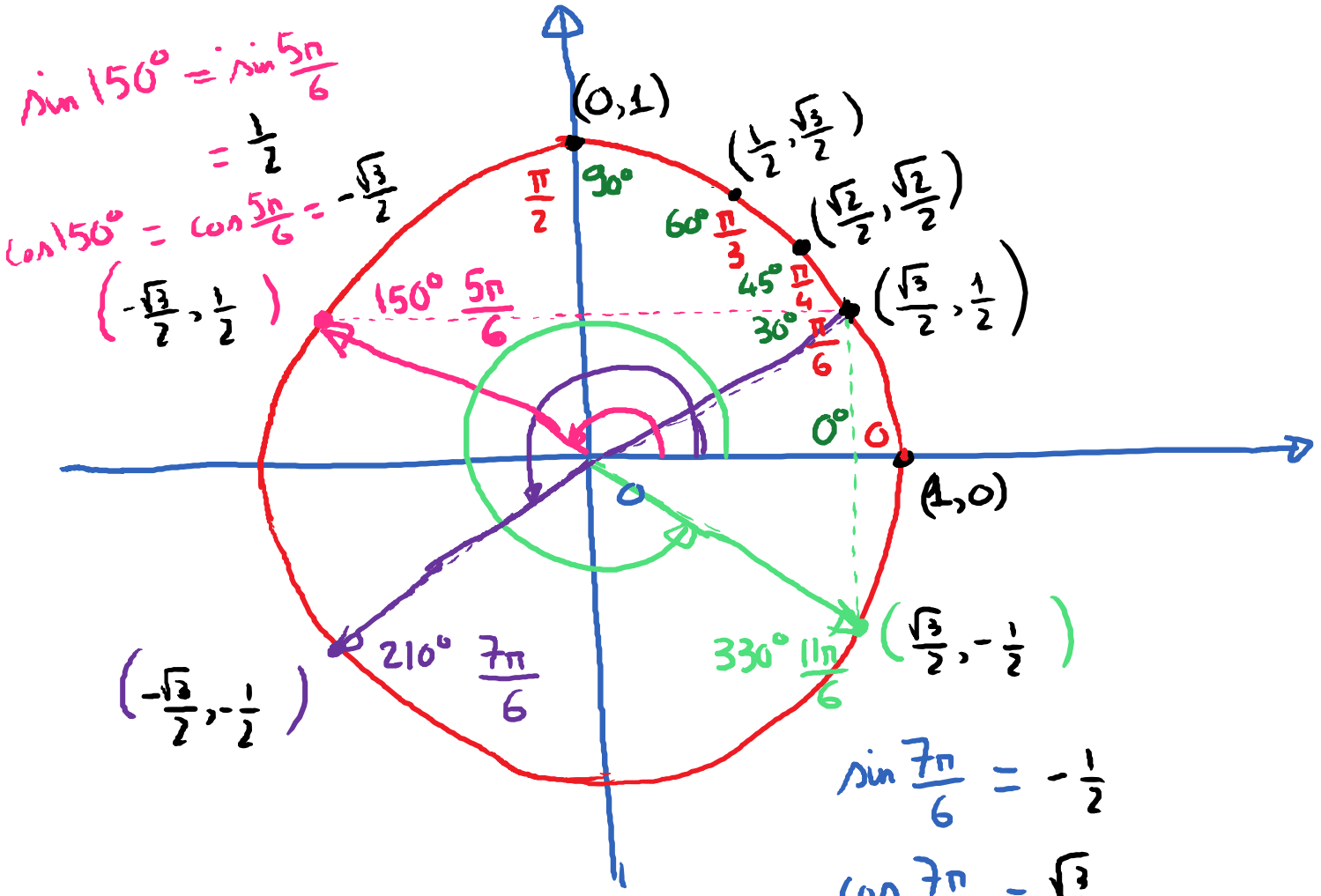
$\csc\theta = \frac{1}{y}$

$\cot\theta = \frac{x}{y}$.

$\sin 150^\circ = \sin\frac{5\pi}{6} = \frac{1}{2}$

$\cos 150^\circ = \cos\frac{5\pi}{6} = -\frac{\sqrt{3}}{2}$

$\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

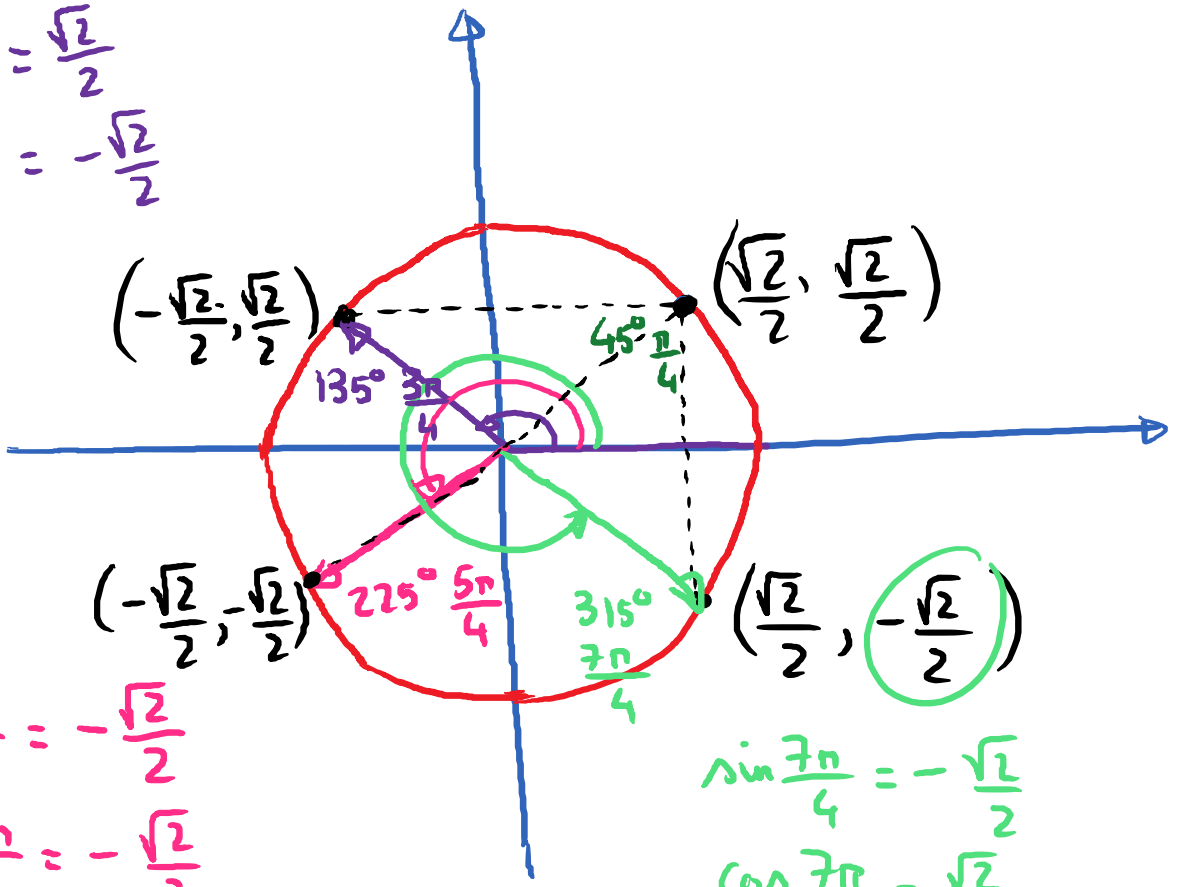


$\sin\frac{7\pi}{6} = -\frac{1}{2}$

$\cos\frac{7\pi}{6} = \frac{\sqrt{3}}{2}$.

$\sin\frac{3\pi}{4} = \frac{\sqrt{2}}{2}$

$\cos\frac{3\pi}{4} = -\frac{\sqrt{2}}{2}$



$\sin\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$

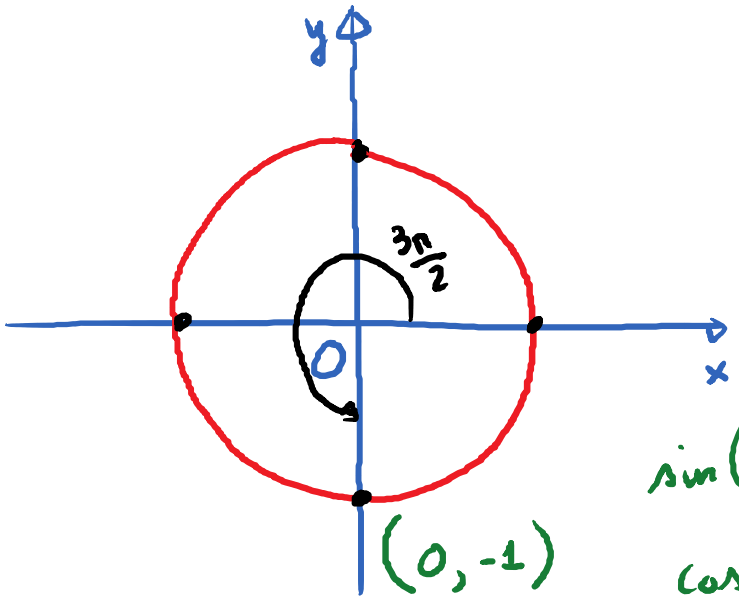
$\cos\frac{5\pi}{4} = -\frac{\sqrt{2}}{2}$

$\sin\frac{7\pi}{4} = -\frac{\sqrt{2}}{2}$

$\cos\frac{7\pi}{4} = \frac{\sqrt{2}}{2}$.

E.g. Find $\tan\left(\frac{3\pi}{2}\right)$.

$\tan\left(\frac{3\pi}{2}\right) = \frac{-1}{0}$ = undefined.



$\sin\left(\frac{3\pi}{2}\right) = -1$

$\cos\left(\frac{3\pi}{2}\right) = 0$

E.g. Find $\csc\left(\frac{11\pi}{2}\right)$

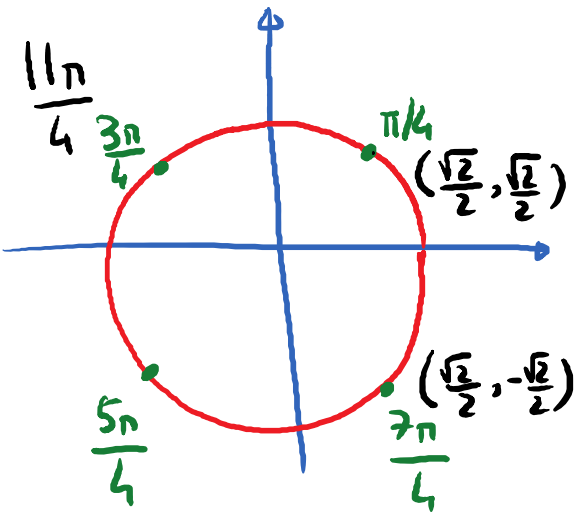
$\sin\left(\frac{11\pi}{2}\right) = -1$; $\csc\left(\frac{11\pi}{2}\right) = -1$

Ex. (1) Find $\cos\frac{7\pi}{4}$; $\sin\frac{7\pi}{4}$

(2) Find $\cos\frac{11\pi}{4}$, $\sin\frac{11\pi}{4}$.

$\cos\left(\frac{11\pi}{4}\right) = -\frac{\sqrt{2}}{2}$

$\sin\left(\frac{11\pi}{4}\right) = \frac{\sqrt{2}}{2}$.



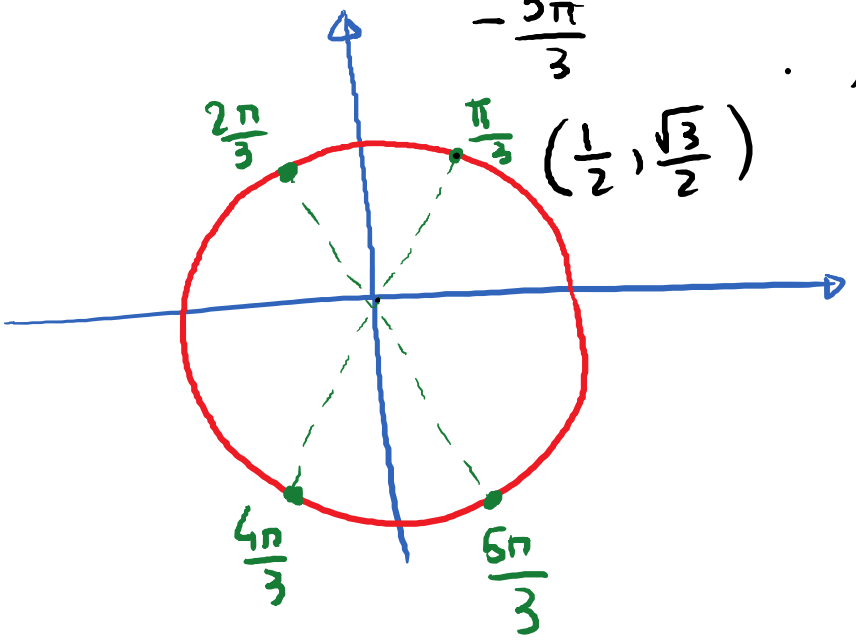
$\cos\frac{7\pi}{4} = \frac{\sqrt{2}}{2}$, $\sin\frac{7\pi}{4} = -\frac{\sqrt{2}}{2}$

Ex. Find $\tan\left(-\frac{5\pi}{3}\right)$.

$\cos\left(-\frac{5\pi}{3}\right) = \frac{1}{2}$

$\sin\left(-\frac{5\pi}{3}\right) = \frac{\sqrt{3}}{2}$

$\tan\left(-\frac{5\pi}{3}\right) = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}.$



Ex. Find $\sec\left(\frac{13\pi}{6}\right)$.

$\cos\left(\frac{13\pi}{2}\right) = \frac{\sqrt{3}}{2}$

$\sec\left(\frac{13\pi}{2}\right) = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{2\sqrt{3}}{3}.$