Section 5.3 Intro to Trig Identities

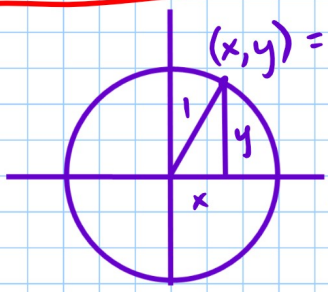
$\tan\theta = \frac{\sin\theta}{\cos\theta}$ $\quad \cot\theta = \frac{\cos\theta}{\sin\theta}$ or $\frac{1}{\tan\theta}$

$\csc\theta = \frac{1}{\sin\theta}$ $\quad \sec\theta = \frac{1}{\cos\theta}$

$\sin^2\frac{\pi}{4} = \left(\sin\frac{\pi}{4}\right)^2 = \left(\frac{\sqrt{2}}{2}\right)^2 = \frac{2}{4} = \frac{1}{2}$

Pythagorean Identities

NOTE: $(\sin\theta)^2 = \sin^2\theta$



$y^2 + x^2 = 1^2$

$\frac{\sin^2\theta}{\sin^2\theta} + \frac{\cos^2\theta}{\sin^2\theta} = \frac{1}{\sin^2\theta}$

$\frac{\sin^2\theta}{\cos^2\theta} + \frac{\cos^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$

$\Rightarrow \sin^2\theta + \cos^2\theta = 1$

$\Rightarrow 1 + \cot^2\theta = \csc^2\theta$

$\Rightarrow \tan^2\theta + 1 = \sec^2\theta$

ex 26 p411 $\quad \sin\theta = \frac{4}{5} \quad \cos\theta = \frac{-3}{5}$

WAY 1: use identities

$\tan\theta = \frac{\sin\theta}{\cos\theta} = \frac{\frac{4}{5}}{\frac{-3}{5}} = \frac{4}{5}\cdot\frac{5}{-3} = -\frac{4}{3}$

$\cot\theta = \frac{1}{\tan\theta} = \frac{1}{-\frac{4}{3}} = -\frac{3}{4}$

$\sec\theta = \frac{1}{\cos\theta} = \frac{1}{-\frac{3}{5}} = -\frac{5}{3}$

$\csc\theta = \frac{1}{\sin\theta} = \frac{1}{\frac{4}{5}} = \frac{5}{4}$

WAY 2: use x, y, and r

$\sin\theta = \frac{y}{r}$ $\quad \csc\theta = \frac{r}{y}$

$\cos\theta = \frac{x}{r}$ $\quad \sec\theta = \frac{r}{x}$

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

$\sin\theta = \frac{4}{5} = \frac{y}{r}$ $\quad x = -3$

$y = 4$

$\cos\theta = \frac{-3}{5} = \frac{x}{r}$ $\quad r = 5$

$\tan\theta = \frac{4}{-3}$ $\quad \cot\theta = -\frac{3}{4}$

$\sec\theta = \frac{5}{-3}$ $\quad \csc\theta = \frac{5}{4}$

ex 42 p412 $\cos\theta = -\frac{1}{4}$ $\tan\theta > 0$

$\cos\theta < 0$

II | I

III | IV

III: $x<0$, $y<0$

$x = -1$

$r = 4$

$y = -\sqrt{15}$

$x^2 + y^2 = r^2$

$(-1)^2 + y^2 = 4^2$

$1 + y^2 = 16$

$y^2 = 15$

$y = -\sqrt{15}$

$\sin\theta = -\frac{\sqrt{15}}{4}$

$\tan\theta = \frac{-\sqrt{15}}{-1} = \sqrt{15}$

$\csc\theta = \frac{4}{-\sqrt{15}} \cdot \frac{\sqrt{15}}{\sqrt{15}} = -\frac{4\sqrt{15}}{15}$

$\sec\theta = \frac{4}{-1} = -4$

$\cot\theta = \frac{1}{\sqrt{15}} \cdot \frac{\sqrt{15}}{\sqrt{15}} = \frac{\sqrt{15}}{15}$

EVEN ODD PROPERTIES

ODD $f(-x) = -f(x)$:

$\sin(-\theta) = -\sin\theta$

$\csc(-\theta) = -\csc\theta$

$\tan(-\theta) = -\tan\theta$

$\cot(-\theta) = -\cot\theta$

EVEN $f(-x) = f(x)$:

$\cos(-\theta) = \cos\theta$

$\sec(-\theta) = \sec\theta$

$\cot(-120^\circ) = -\cot 120^\circ = -\left(-\frac{\sqrt{3}}{3}\right) = \frac{\sqrt{3}}{3}$

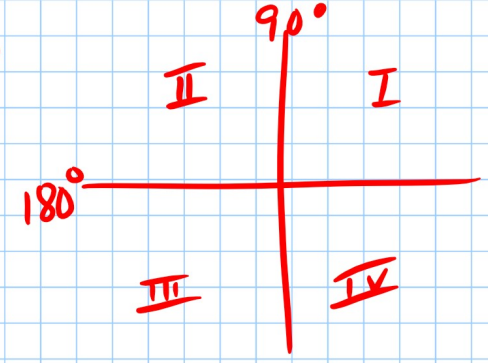
$\sec\left(-\frac{7\pi}{6}\right) = \sec\frac{7\pi}{6} = -\frac{2\sqrt{3}}{3}$

p411-412 25, 31, 37, 41, 49-73 eoo

(37) $\sin\theta = \frac{5}{13}$ $\quad 90^\circ < \theta < 180^\circ$

QII

$x<0, y>0$



$y = 5$

$r = 13$

$x = -12$

$x^2 + 5^2 = 13^2$

$x^2 + 25 = 169$

$x^2 = 144$

$x = -\sqrt{144} = -12$

$\cos\theta = -\frac{12}{13}$

$\tan\theta = -\frac{5}{12}$

$\csc\theta = \frac{13}{5}$

$\sec\theta = -\frac{13}{12}$

$\cot\theta = -\frac{12}{5}$