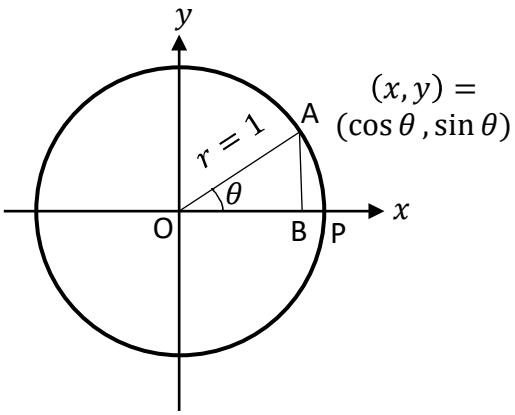
QxQ Trigonometry Cheat Sheet

Unit Circle



Radians:

$\angle AOB = \theta$ (arc length AP)

- Radians to degrees:

$$\angle AOB = \frac{180^0}{\pi}\theta = \phi^0$$

- Degrees to Radians

$$\angle AOB = \frac{\pi}{180^0}\phi^0 = \theta$$

Trigonometric Functions:

$$\cos\theta = x = OB$$
$$\sin\theta = y = AB$$
$$\tan\theta = \frac{y}{x} = \frac{AB}{OB}$$
$$\text{cosec}\,\theta = \frac{1}{\sin\theta}$$
$$\sec\theta = \frac{1}{\cos\theta}$$
$$\cot\theta = \frac{1}{\tan\theta}$$

From the unit circle:

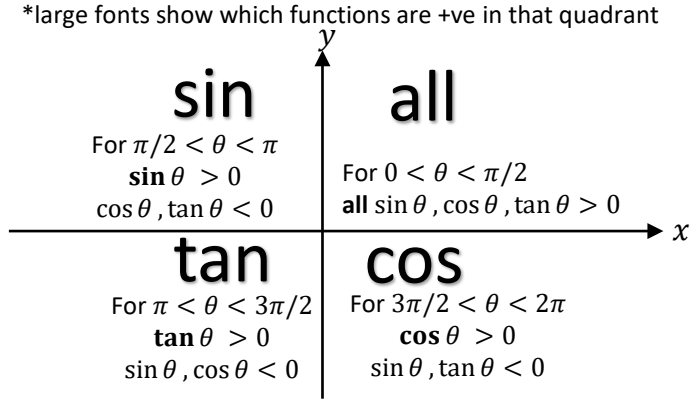
$$\sin^2\theta + \cos^2\theta = 1$$

Common Angles to Remember

ϕ^0	θ(rad)	$\sin\theta$	$\cos\theta$	$\tan\theta$
0	0	1	1	0
30^0	$\pi/6$	$\frac{1}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{3}}$
45^0	$\pi/4$	$\frac{1}{\sqrt{2}}$	$\frac{1}{\sqrt{2}}$	1
60^0	$\pi/3$	$\frac{\sqrt{3}}{2}$	$\frac{1}{2}$	$\sqrt{3}$
90^0	$\pi/2$	1	0	∞

Sign of Trigonometric Functions (sin,cos,tan)

*large fonts show which functions are +ve in that quadrant



$$\sin(-\theta) = -\sin\theta\,,\cos(-\theta) = \cos\theta\,,\tan(-\theta) = -\tan\theta$$

Shift by $\pi/2$

$$\sin\left(\theta + \frac{\pi}{2}\right) = \cos\theta\,,\sin\left(\theta - \frac{\pi}{2}\right) = -\cos\theta$$
$$\cos\left(\theta + \frac{\pi}{2}\right) = -\sin\theta\,,\cos\left(\theta - \frac{\pi}{2}\right) = \sin\theta$$

Shift by π

$$\sin(\theta + \pi) = -\sin\theta\,,\sin(\theta - \pi) = -\sin\theta$$
$$\cos(\theta + \pi) = -\cos\theta\,,\cos(\theta - \pi) = -\cos\theta$$

Coordinate Systems

Polar to Cartesian

$$x = r\sin\theta$$
$$y = r\cos\theta$$

Cartesian to Polar

$$r = \sqrt{x^2 + y^2}$$
$$\theta = \tan^{-1}\left(\frac{y}{x}\right)$$

How to get convert tan^{-1} from a calculator

(*For details and reasoning please see @668 on Piazza)

For $(x, y) = (\cos\theta\,,\sin\theta)$, and a calculator value θ_{calc}, where for usual calculators $-\frac{\pi}{2} < \theta_{calc} < \frac{\pi}{2}$

- If $x > 0, y > 0$; then $\theta = \theta_{calc}$
- If $x > 0, y < 0$; then $\theta = \theta_{calc} = \theta_{calc} + 2\pi$
- If $x < 0, y > 0$; then $\theta = \theta_{calc} + \pi$
- If $x < 0, y < 0$; then $\theta = \theta_{calc} + \pi$