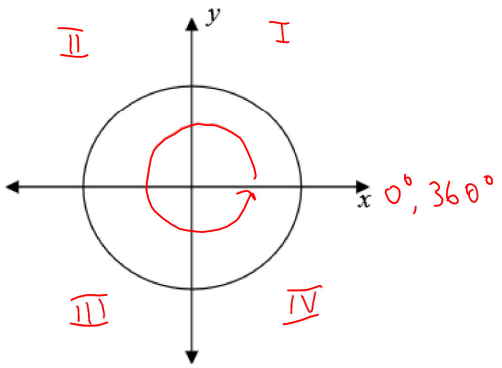
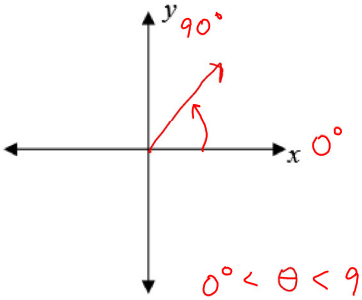
Lesson 1 Angles in Standard Position

Angles in Standard Position

An angle in standard position, is an angle, θ, between 0° and 360° measured counterclockwise from the positive *x*-axis.

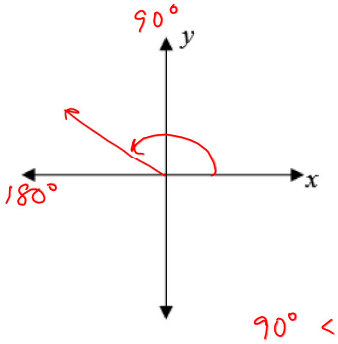


Quadrant I



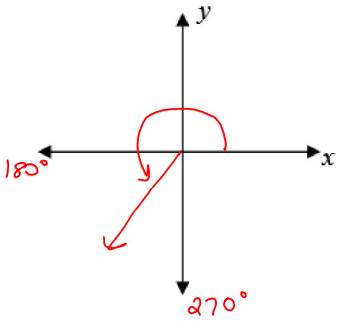
$0° < \theta < 90°$

Quadrant II



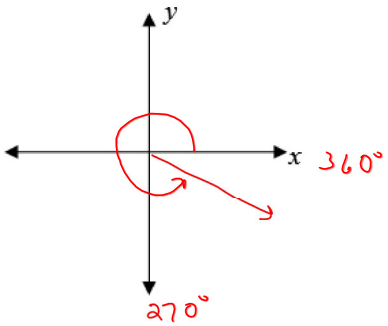
$90° < \theta < 180°$

Quadrant III



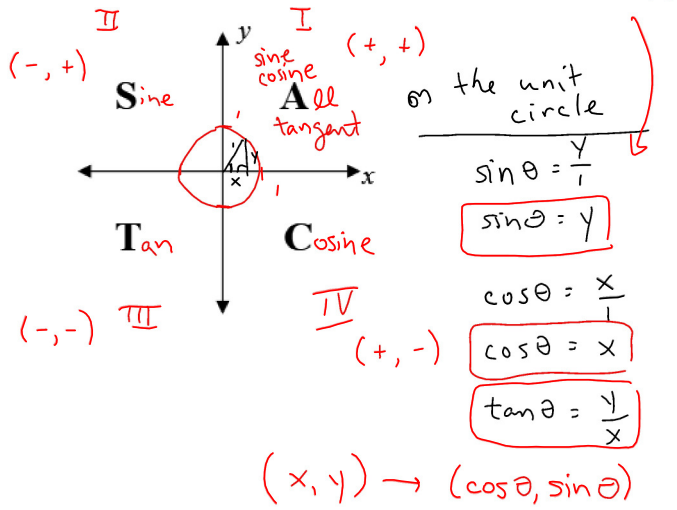
$180° < \theta < 270°$

Quadrant IV



$270° < \theta < 360°$

CAST Rule



CAST Rule

The letter indicates the trig function that is positive in that Quadrant. The other trig functions are negative.

QI – all are positive

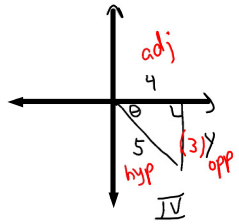
QII – $\sin\theta$ is positive

QIII – $\tan\theta$ is positive

QIV – $\cos\theta$ is positive

Examples

1. Given that $\cos\theta = \frac{4}{5}$, determine the exact values of the other primary trigonometric ratios of the angle, θ, in Quadrant IV.



(3,4,5 triplet)

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

$4^2 + y^2 = 5^2$

$y^2 = 9$

$y = \pm 3$

in QIV

$\therefore y = -3$

$\cos\theta = \frac{4}{5}$ ← given

$\sin\theta = \frac{opp}{hyp}$

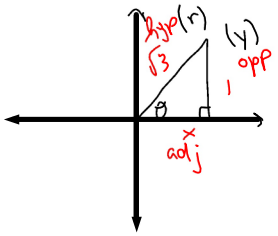
or $\sin\theta = \frac{y}{r}$

$\sin\theta = -\frac{3}{5}$

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

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

2. Determine the exact values of the other primary trigonometric functions if $\sin\theta = \frac{1}{\sqrt{3}}$ in Quadrant I.



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

$x^2 + 1^2 = (\sqrt{3})^2$

$x^2 = 2$

$x = \pm\sqrt{2}$

in QI $x = \sqrt{2}$

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

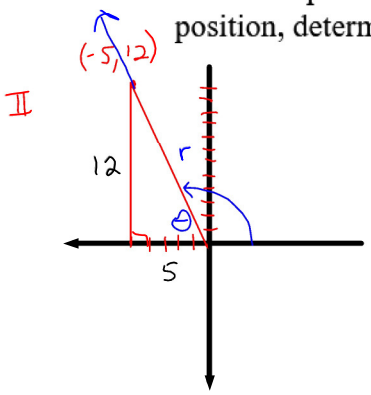
$\cos\theta = \frac{\sqrt{6}}{3}$

$\tan\theta = \frac{1}{\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right)$

$\tan\theta = \frac{\sqrt{2}}{2}$

Assign pg 114 #1, 5a,b, c, d

3. Given the point P(-5, 12) is on the terminal arm of an angle, θ, in standard position, determine the primary trigonometric ratios of θ.



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

$5^2 + 12^2 = r^2$

$169 = r^2$

$\pm 13 = r$

radius is always +ve

$\therefore r = 13$

5, 12, 13 triplet

$\cos\theta = \frac{-5}{13}$

$\sin\theta = \frac{12}{13}$

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

* use SOH CAH TOA

a) I, II

b) I, IV

c) II, IV

d) III, IV

e) II, III

f) II, IV

g) I

h) IV

i) III

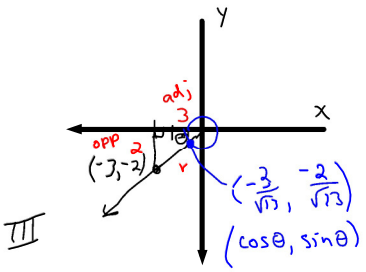
j) IV

k) III

l) II

4. P(x, y) is a point on the terminal side of angle θ in standard position. Determine the exact values of $\sin\theta$, $\cos\theta$, and $\tan\theta$ of the given points.

a) (–3,-2)



$2^2 + 3^2 = r^2$

$13 = r^2$

$\pm\sqrt{13} = r$

$\therefore r = \sqrt{13}$ since radius is +ve

$\sin\theta = \frac{-2}{\sqrt{13}}$ or $\frac{-2\sqrt{13}}{13}$

$\cos\theta = \frac{-3}{\sqrt{13}}$ or $\frac{-3\sqrt{13}}{13}$

$\tan\theta = \frac{2}{3}$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$

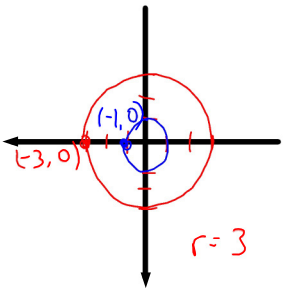
$= \frac{\frac{-2}{\sqrt{13}}}{\frac{-3}{\sqrt{13}}}$

$= \frac{2}{3}$

$\frac{-2}{\sqrt{13}} \cdot \frac{\sqrt{13}}{-3}$

× y

b) (-3, 0)



$\cos\theta = \frac{x}{r}$ (adj/hyp)

$= \frac{-3}{3}$

$= -1$

$\sin\theta = \frac{y}{r}$ (opp/hyp)

$= \frac{0}{3}$

$= 0$

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

$= \frac{0}{-3}$

$= 0$

on the unit circle

$(x, y) \rightarrow (\cos\theta, \sin\theta)$

pg 115 # 3 a, c, f, h, i, l, m, p