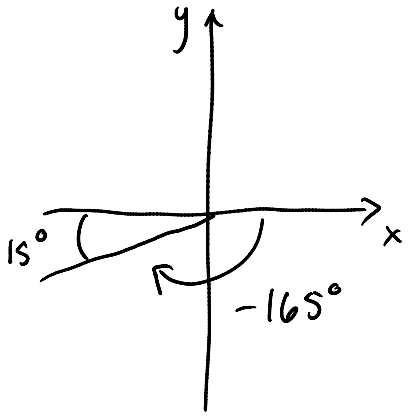
Section 4.4: cont'd

Wednesday, November 12, 2014
8:36 AM

Assignments #5: due Monday, Nov 17

---

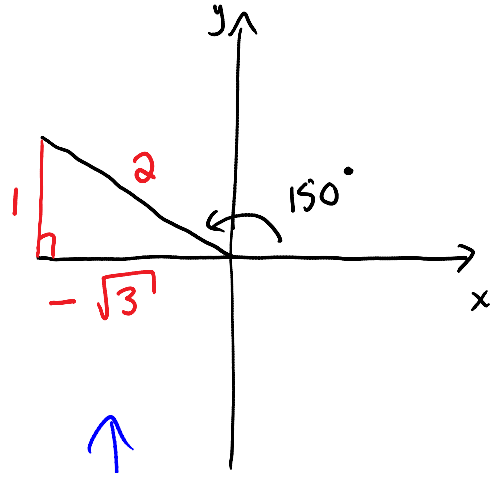
reference angle:



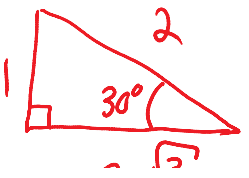
15° is the reference angle to -165°

→ it is the positive angle between the terminal arm and the nearest X-axis

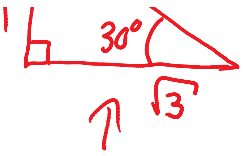
Why do we care about reference angles?



what, then, is sin 150°?



when your triangle is embedded in a coordinate system, then can have negatives (coordinates, not sides)



30° is the reference angle

so $\sin 150° = \frac{\text{opp}}{\text{hyp}} = \frac{1}{2}$

$\cos 150° = \frac{\text{adj}}{\text{hyp}} = \frac{-\sqrt{3}}{2} \approx -0.866$

$\tan 150° = \frac{\text{opp}}{\text{adj}} = \frac{1}{-\sqrt{3}} \frac{\sqrt{3}}{\sqrt{3}} = -\frac{\sqrt{3}}{3} \approx -0.571$

so, for trig functions of any angle, the x- and y- coordinates will be + or − depending on which quadrant you're in, so the trig functions will also be + or −

example: calculate to 2 decimals:

$\sin 342° = -0.31$

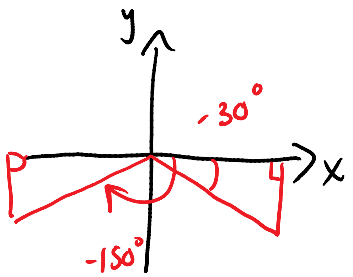
$\tan 83° = 8.14$

$\cos -30° = 0.87$

$\cos -150° = -0.87$

$\sin 1,335,872.89° = -1.00$ (-0.998728)

Why do cos $-30°$ and cos $-150°$ have the same magnitude?



adj is −

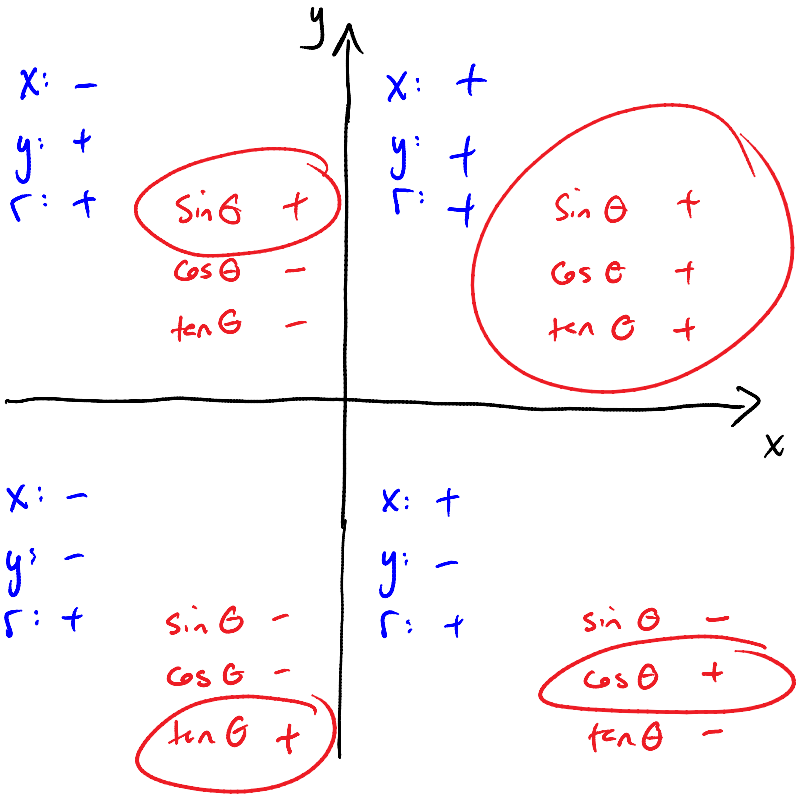
adj is +

hyp is always +
sign on adj depends on which quadrant you're in

---

how can you tell whether a particular angle will give a + or − value for the trig function?

note: calculator will always calculate the correct sign

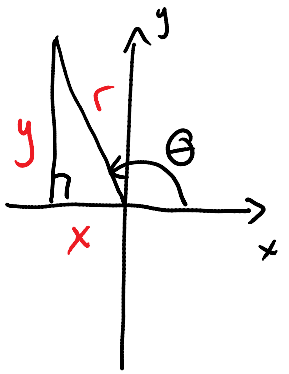


ASTC

All Students Take Calculus

↑

quick way to remember



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

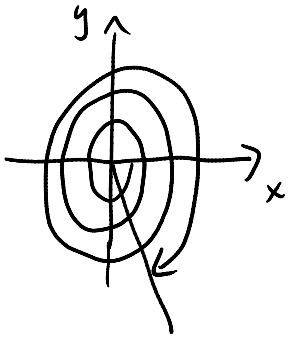
$\cos\theta = \frac{x}{r}$

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

r is always $+$

---

example: Consider the following angle, θ. Will $\sin\theta$ be $+$ or $-$?

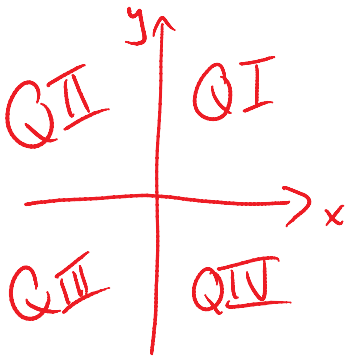


$\sin\theta$ is negative

($\cos\theta$ is the only $+$ one in this quadrant)

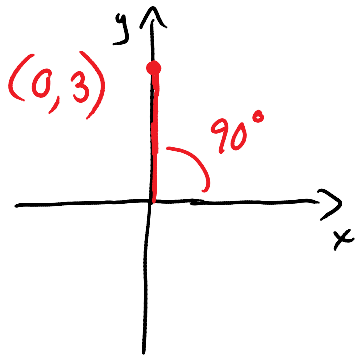
---

example: State whether the three basic trig functions of an angle in Quadrant III will be $+$ or $-$



sin −
cos −
tan +

What about <u>quadrantal</u> angles? an angle whose terminal arm lies on one of the axes



$x = 0$
$y = 3$
$r = 3$ (distance from origin to that point)

recall:

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

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

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

$$\sin 90° = \frac{y}{r} = \frac{3}{3} = 1$$

$$\cos 90° = \frac{x}{r} = \frac{0}{3} = 0$$

$$\tan 90° = \frac{y}{x} = \frac{3}{0} = \text{undefined (ONE)}$$

NOTE!

DO NOT WRITE "Math error 2"

$\Rightarrow$ trig functions of quadrantal angles take on one of four possible values:

1
0
-1
undefined

calculate the following to 2 decimal places:

$\sin^{-1}(0.325) = 18.97^\circ$

$\cos^{-1}(-0.77) = 140.35^\circ$

$\tan^{-1}(-12.1) = -85.28^\circ$

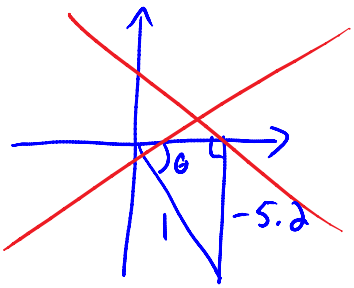
$\sin^{-1}(-5.2) =$ undefined or ONE

why?

if $\theta = \sin^{-1}(-5.2)$

$\sin\theta = -5.2$

not possible



one last wrinkle (I want test)

$\sin^{-1} x$

↑

the arcsin function only returns angles between -90° and 90° inclusive