



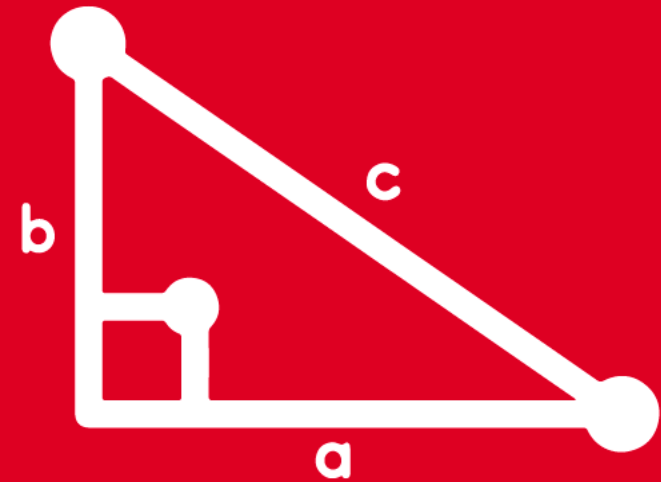
TRIGONOMETRY

Chapter 4

Verano 2021

SAN MARCOS

**Reducción al
Primer Cuadrante**



 **SACO OLIVEROS**



Sistema de Radar:

El radar es un sistema electrónico que permite detectar objetos y determinar la distancia y su velocidad, ello lo realiza proyectando ondas de radio que son reflejadas por el objeto y recibidas de nuevo por la antena.

La antena de radar gira (360°) en un mismo sentido a velocidad constante mostrando la señal en la pantalla.



Transmisor /
Receptor

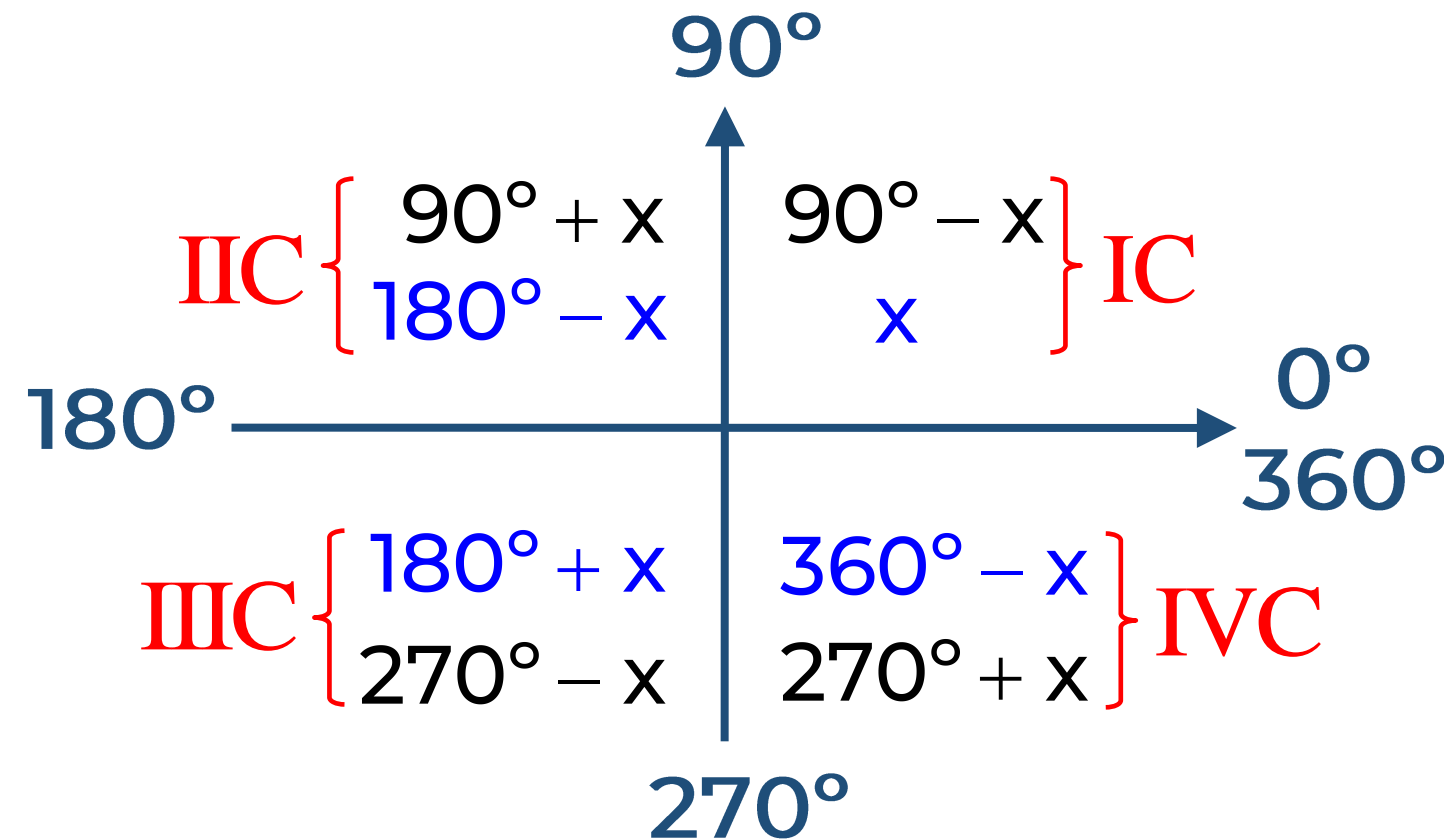


Pantalla
de radar



REDUCCIÓN AL PRIMER CUADRANTE

1º CASO : Para ángulos positivos menores a una vuelta



$$\left(\begin{array}{c} \pm \\ - \end{array} \right) = (\pm)$$

$$\left(\begin{array}{c} \pm \\ \pm \end{array} \right) = (\pm)$$

$$\text{sen} \Leftrightarrow \text{cos}$$

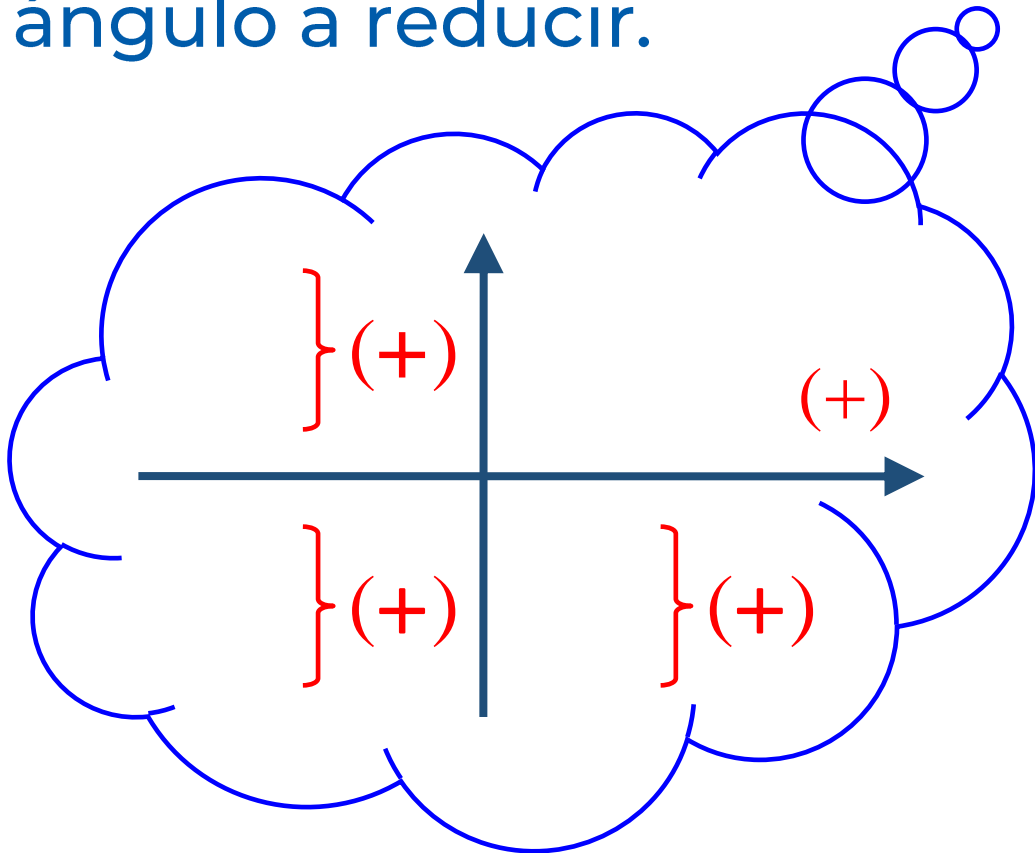
$$\text{tan} \Leftrightarrow \text{cot}$$

$$\text{sec} \Leftrightarrow \text{csc}$$





Donde el signo (\pm) del segundo miembro depende de la RT y el cuadrante al cual pertenece el ángulo a reducir.



EJEMPLOS: Reducir al IC

$$\bullet \text{ sen } (180^\circ - x) = + \text{ sen } (x)$$

IIC

$$\bullet \text{ tan } (270^\circ + x) = - \text{ cot } (x)$$

IVC

$$\bullet \text{ cos } (240^\circ) = \text{ cos } (180^\circ + 60^\circ)$$

IIC

$$\text{ cos } (240^\circ) = - \text{ cos } (60^\circ)$$

$$\text{ cos } (240^\circ) = -\frac{1}{2}$$





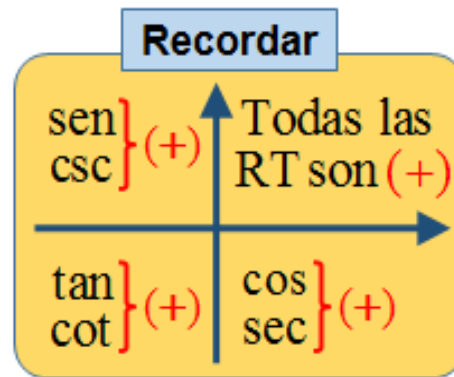
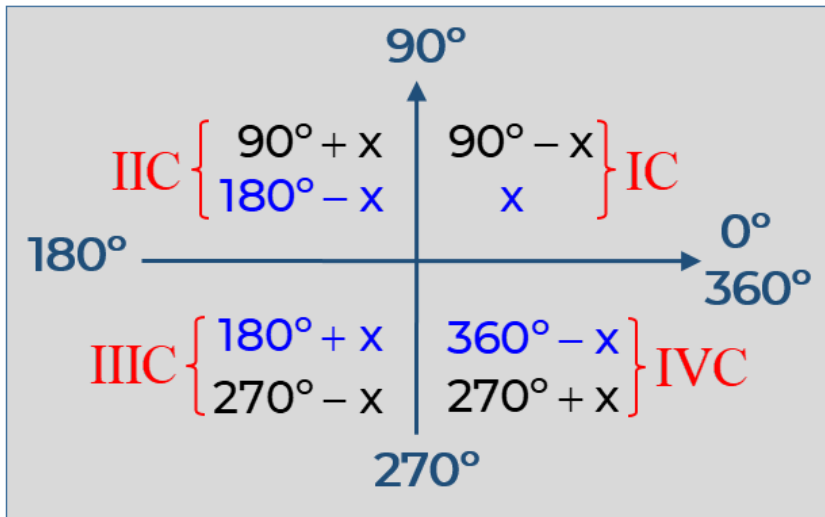
1. Reduzca:

$$\text{➤ } \sin(180^\circ - x) =$$

$$\text{➤ } \tan(360^\circ - x) =$$

$$\text{➤ } \sec(180^\circ + x) =$$

Ángulos en cada cuadrante



RESOLUCIÓN

Reduciendo al IC:

$$\text{➤ } \sin(180^\circ - x) = + \sin(x)$$

IIC

$$\text{➤ } \tan(360^\circ - x) = - \tan(x)$$

IVC

$$\text{➤ } \sec(180^\circ + x) = - \sec(x)$$

IIIC



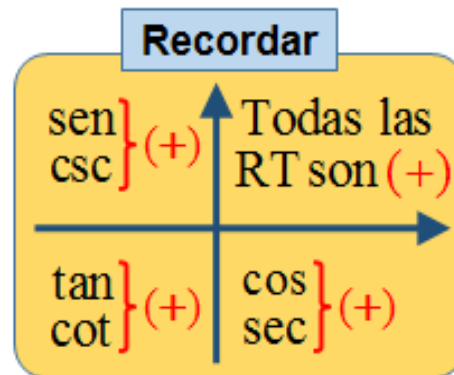
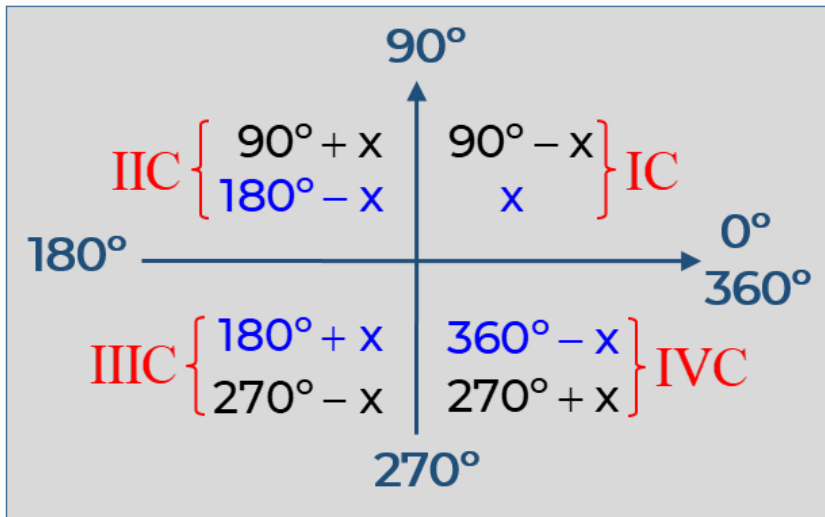
2. Reduzca:

$$\text{➤ } \cos(270^\circ + x) =$$

$$\text{➤ } \cot(90^\circ + x) =$$

$$\text{➤ } \csc(270^\circ - x) =$$

Ángulos en cada cuadrante



RESOLUCIÓN

Reduciendo al IC:

$$\text{➤ } \cos(270^\circ + x) = + \sin(x)$$

IVC

$$\text{➤ } \cot(90^\circ + x) = - \tan(x)$$

IIC

$$\text{➤ } \csc(270^\circ - x) = - \sec(x)$$

IIIC



3. Determine:

$$M = \cos(180^\circ + x) + \sin(90^\circ + x)$$

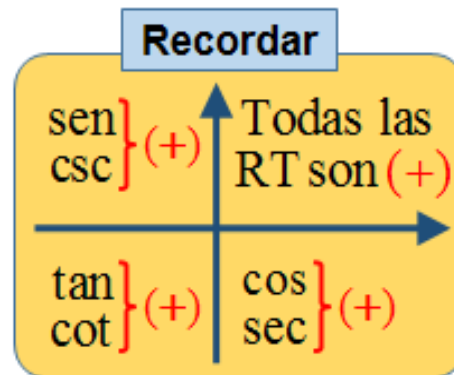
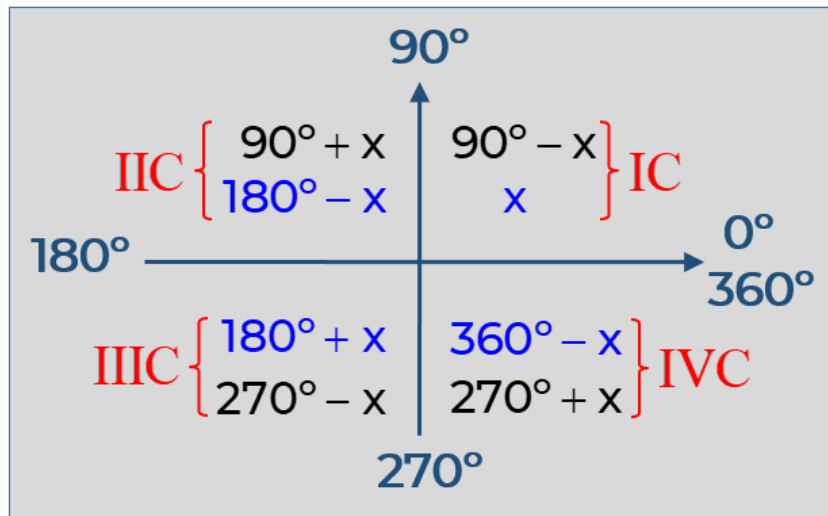
~~A) 0~~

B) $2\cos x$

C) -2

D) 2

Ángulos en cada cuadrante



RESOLUCIÓN

Reduciendo al IC:

$$M = \cos(180^\circ + x) + \sin(90^\circ + x)$$

$$M = \underbrace{\cos(180^\circ + x)}_{\text{IIC}} + \underbrace{\sin(90^\circ + x)}_{\text{IIC}}$$

$$M = [-\cos(x)] + [+ \cos(x)]$$

$$M = -\cos(x) + \cos(x)$$

$$\therefore M = 0$$



5. Simplifique:

$$H = \frac{\sin(180^\circ + x)}{\cos(90^\circ + x)} - \frac{\cos(360^\circ - x)}{\cos(180^\circ + x)}$$

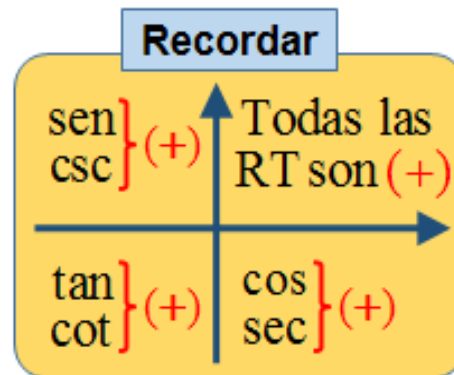
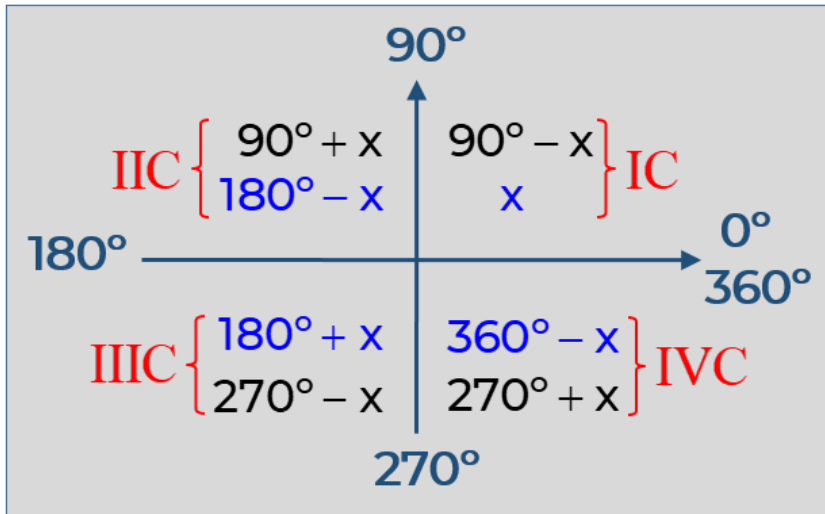
A) $-\cos^2 x$

~~B) 2~~

C) -2

D) $-\sin^2 x$

Ángulos en cada cuadrante



RESOLUCIÓN

Reduciendo al IC:

$$H = \frac{\overbrace{\sin(180^\circ + x)}^{\text{IIC}}}{\underbrace{\cos(90^\circ + x)}_{\text{IIC}}} - \frac{\overbrace{\cos(360^\circ - x)}^{\text{IVC}}}{\underbrace{\cos(180^\circ + x)}_{\text{IIC}}}$$

$$H = \frac{-}{-} - \frac{+}{-}$$

$$H = + +$$

$$\therefore H = 2$$



6. Reduzca:

$$= \frac{\pi + \left(\frac{\pi}{-} - \right)}{\pi - \pi +}$$

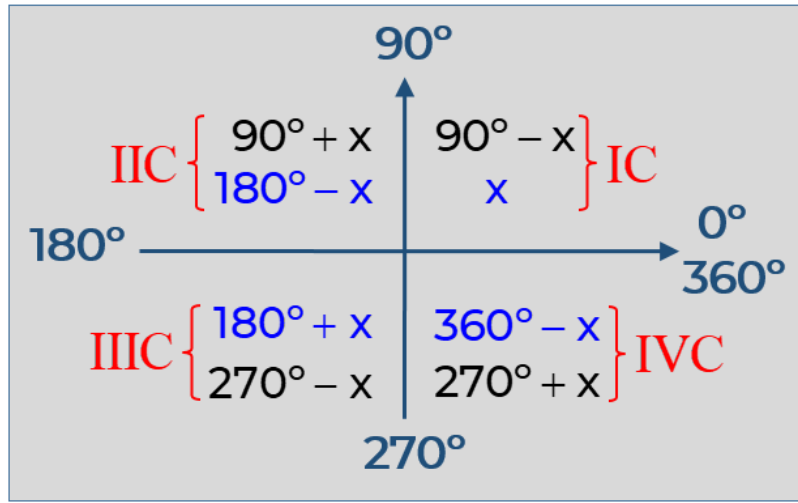
~~A) 1~~

B) 2

C) -1

D) -2

Ángulos en cada cuadrante



$$\frac{\pi}{2} \text{ rad} = 90^\circ$$

$$\frac{3\pi}{2} \text{ rad} = 270^\circ$$

$$\pi \text{ rad} = 180^\circ$$

$$2\pi \text{ rad} = 360^\circ$$

Recordar	
sen (+)	Todas las RT son (+)
csc (+)	
tan (+)	
cot (+)	
cos (+)	
sec (+)	

RESOLUCIÓN

Reduciendo al IC:

$$= \frac{\text{IIC} + \text{IC}}{\text{IVC} + \text{IC}}$$

$$= \frac{\begin{bmatrix} - \\ - \end{bmatrix} \begin{bmatrix} + \\ + \end{bmatrix}}{\begin{bmatrix} - \\ - \end{bmatrix} \begin{bmatrix} + \\ + \end{bmatrix}}$$

$$\therefore J = 1$$



7. Determine:

$$E = \tan 135^\circ + \sqrt{3} \cos 330^\circ \dots (*)$$

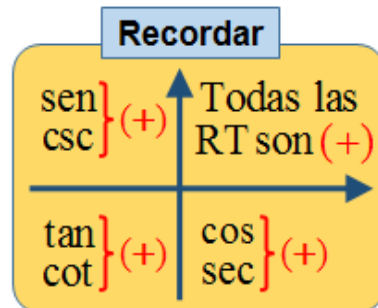
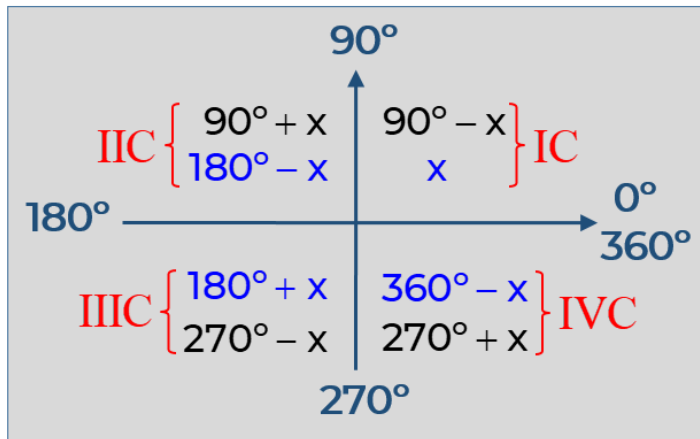
A) -1

B) $\sqrt{2}$

~~C) 1/2~~

D) -2

Ángulos en cada cuadrante



RESOLUCIÓN

Reduciendo al IC:

$$\bullet \tan (135^\circ) = \tan (180^\circ - 45^\circ)$$

IIC

$$\tan (135^\circ) = - \tan (45^\circ) = -1$$

$$\bullet \cos (330^\circ) = \cos (360^\circ - 30^\circ)$$

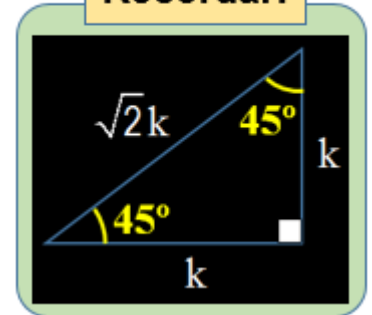
IVC

$$\cos (330^\circ) = + \cos (30^\circ) = + \frac{\sqrt{3}}{2}$$

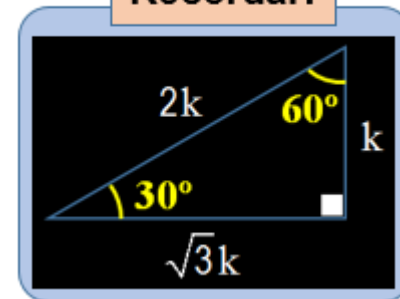
En

$$(*) : E = (-1) + \sqrt{3} \left(\frac{\sqrt{3}}{2} \right) = -1 + \frac{3}{2}$$

Recordar:



Recordar:



$$\therefore E = 1/2$$



8. Determine:

$$E = \sec 240^\circ + \cot 135^\circ + \csc 330^\circ$$

A) 1

B) 3

C) 5

~~D) -5~~

RESOLUCIÓN

• Piden: $E = \sec 240^\circ + \cot 135^\circ + \csc 330^\circ$

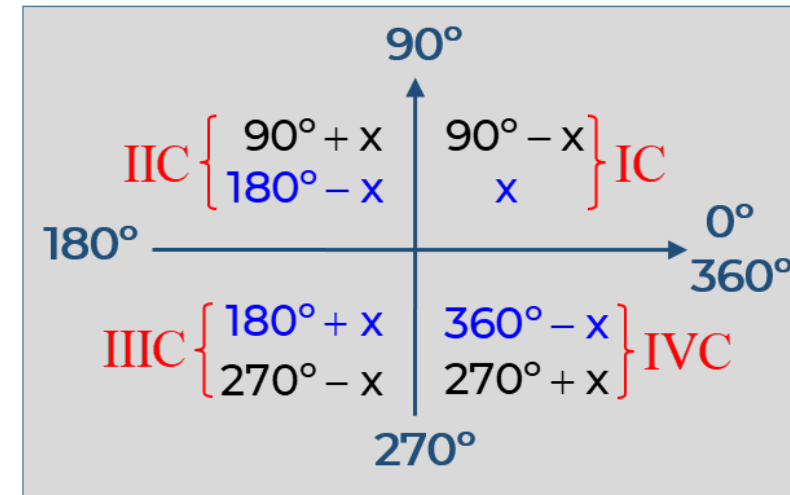
$$\Rightarrow E = \sec(180^\circ + 60^\circ) + \cot(180^\circ - 45^\circ) + \csc(360^\circ - 30^\circ)$$

$$\Rightarrow E = \overset{\text{IIIC}}{\left[-\sec(60^\circ) \right]} + \overset{\text{IIC}}{\left[-\cot(45^\circ) \right]} + \overset{\text{IVC}}{\left[-\csc(30^\circ) \right]}$$

$$\Rightarrow E = \left[- \right] + \left[- \right] + \left[- \right]$$

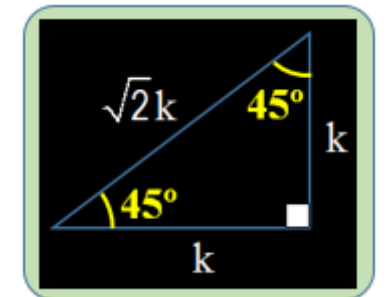
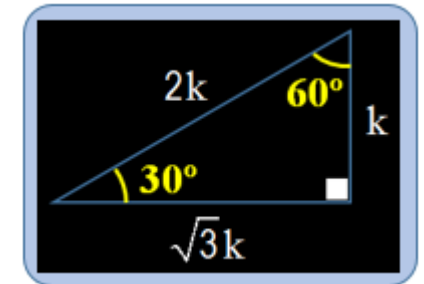
$$\therefore E = -5$$

Ángulos en cada cuadrante



Recordar

sen csc	(+)	Todas las RT son (+)
tan cot	(+)	cos sec





9. Si $x + y = \pi$, determine:

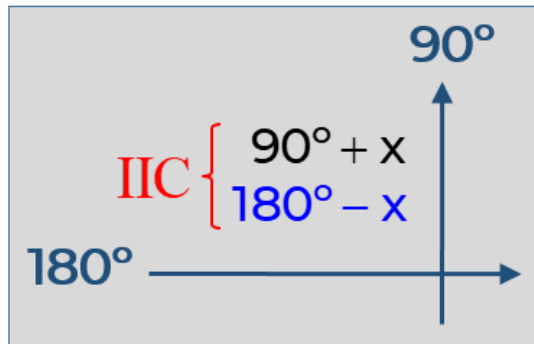
$$E = \operatorname{sen} x \cdot \operatorname{csc} y + \tan x \cdot \cot y$$

~~A) 0~~

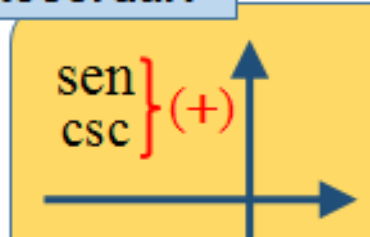
B) -1

C) 1

D) 2



Recordar:



R.T. RECÍPROCAS

$$\operatorname{sen} \alpha \cdot \operatorname{csc} \alpha = 1$$

$$\tan \alpha \cdot \cot \alpha = 1$$

RESOLUCIÓN

Dato: $x + y = 180^\circ \Rightarrow y = 180^\circ - x \dots (\alpha)$

Piden: $E = \operatorname{sen} x \cdot \operatorname{csc} y + \tan x \cdot \cot y \dots (*)$

(α) en

(*)
$$E = \operatorname{sen} x \cdot \operatorname{csc}(180^\circ - x) + \tan x \cdot \cot(180^\circ - x)$$

Diagram showing the transformation of the expression using the IIC (II Quadrant) signs:

$$E = \operatorname{sen} x \cdot [+ \operatorname{csc}(x)] + \tan x \cdot [- \cot(x)]$$

$$\Rightarrow E = \underbrace{\operatorname{sen} x \cdot \operatorname{csc} x}_1 - \underbrace{\tan x \cdot \cot x}_1$$

$$\therefore E = 0$$



10. Simplifique:

$$= \frac{-}{+} \cdot \frac{+}{+} \cdot \frac{-}{-}$$

A) cota

B) tana

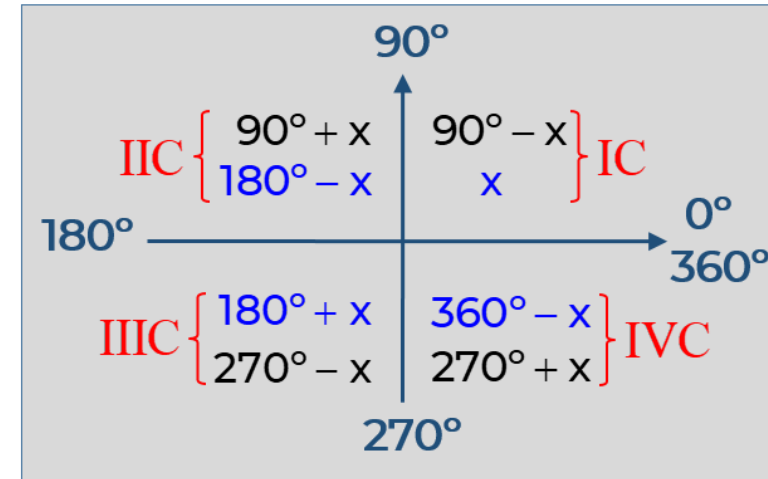
C) -2tana

~~D) $-\text{tana}$~~

RESOLUCIÓN Reduciendo al IC:

$$\begin{aligned} &= \frac{\overbrace{+}^{\text{IIC}}}{\underbrace{+}_{\text{IVC}} \cdot \underbrace{+}_{\text{IIC}} \cdot \underbrace{-}_{\text{IC}}} \\ \Rightarrow &= \frac{\left[\begin{array}{c} - \\ + \end{array} \right] \left[\begin{array}{c} - \\ - \end{array} \right] \left[\begin{array}{c} - \\ - \end{array} \right]}{\left[\begin{array}{c} + \\ - \end{array} \right] \left[\begin{array}{c} - \\ - \end{array} \right] \left[\begin{array}{c} - \\ - \end{array} \right]} \end{aligned}$$

Ángulos en cada cuadrante



Recordar

sen	}	(+) ↑	Todas las RT son (+)
csc			
tan	}	(+) →	cos
cot			
			sec
			(+)

R.T. RECÍPROCAS

$$\text{sen}\alpha \cdot \text{csc}\alpha = 1$$

$$\begin{aligned} \Rightarrow &= - \\ \Rightarrow &= - \quad \times \text{---} \\ \Rightarrow &= - \text{---} \end{aligned}$$

$$\therefore E = -\text{tana}$$

