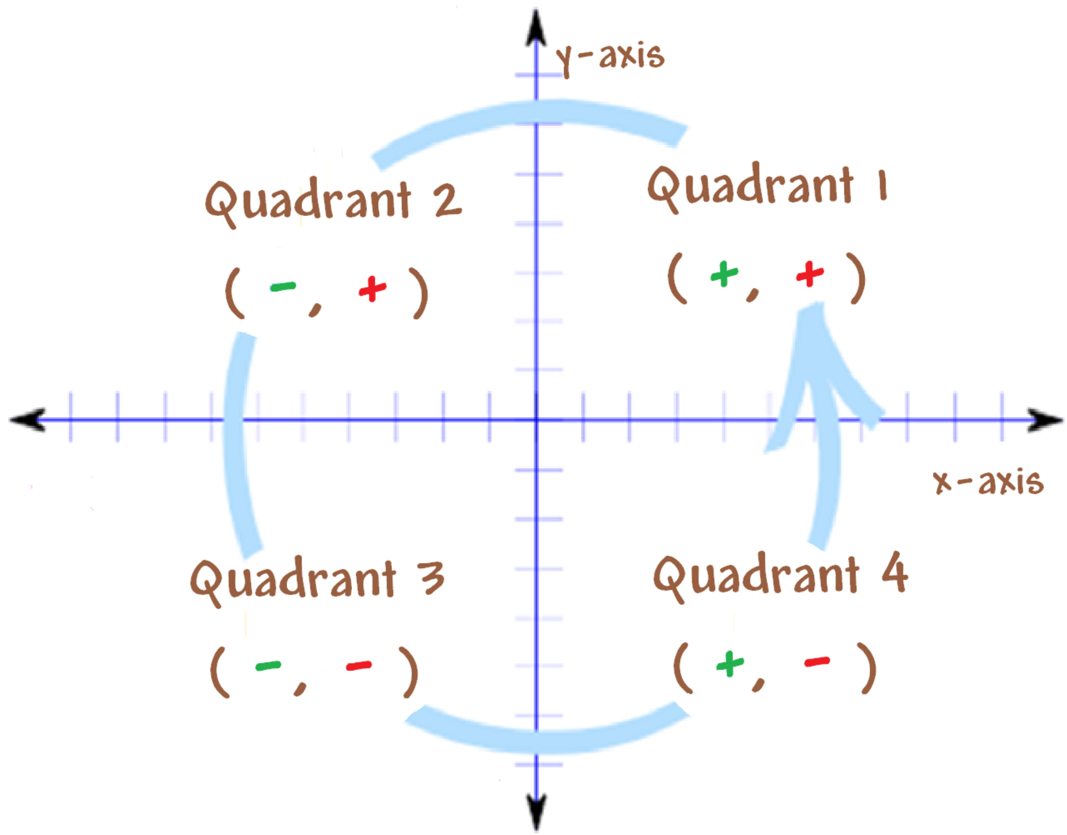
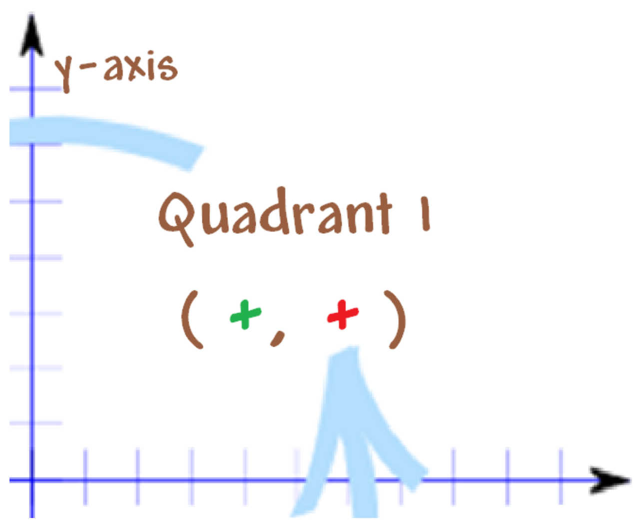
Quadrant 1

Let's take a look at our quadrants for a moment



In particular let's focus on quadrant 1



What do you see?

$(+, +)$

X is positive

Y is positive

$$\cos\theta = \frac{x}{\text{radius}}$$

$$\sin\theta = \frac{y}{\text{radius}}$$

Cosine is positive

Sine is positive

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

Tangent is positive

Do you think that Cosine's best friend (Secant) would be positive also?

YES!! Because Secant is

$$\sec\theta = \frac{\text{radius}}{x}$$

Do you think that Sine's best friend (Cosecant) would be positive also?

YES!! Because Cosecant is

$$\csc\theta = \frac{\text{radius}}{y}$$

Do you think that Tangent's best friend (Cotangent) would be positive also?

YES!! Because Cotangent is

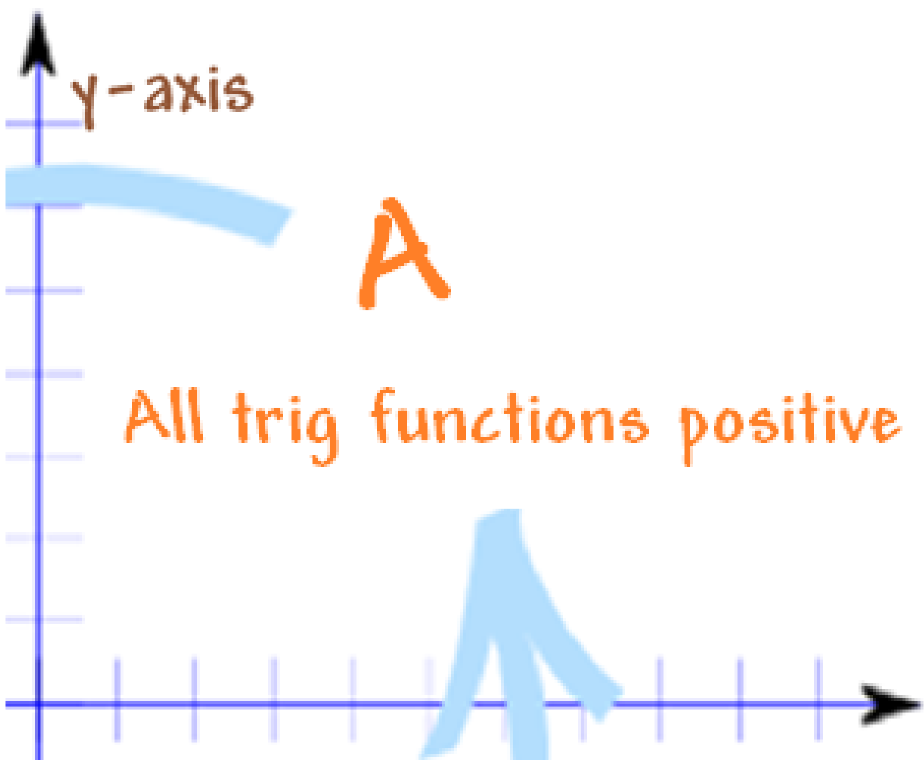
$$\cot\theta = \frac{x}{y}$$

So what a minute this means…

Quadrant 1

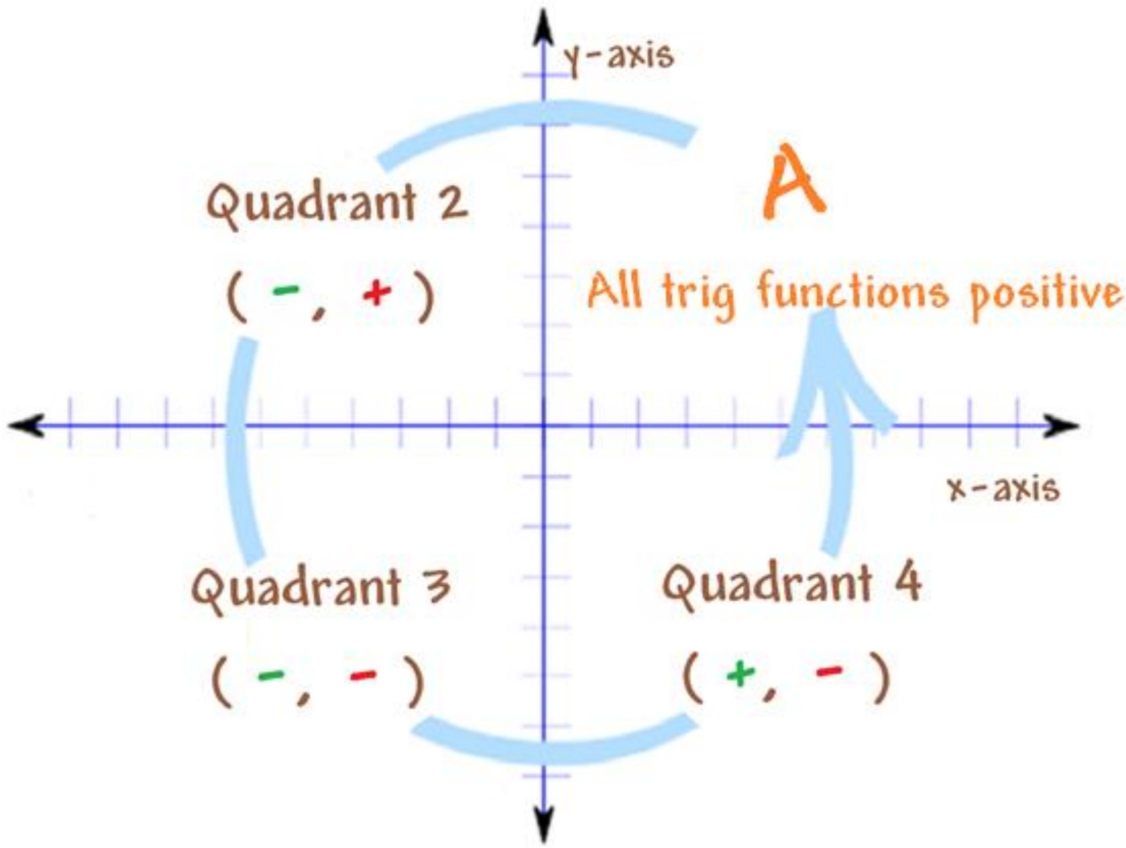
ALL trig functions are positive

So let's put a big ole 'A' in quadrant 1 for ALL

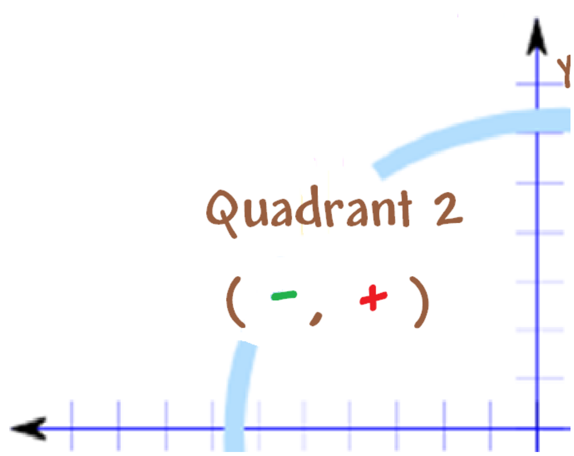


Quadrant 2

Let's take a look at our quadrants for a moment



In particular let's focus on quadrant 2



What do you see?

$$(- , +)$$

X is negative

Y is positive

$$\cos\theta = \frac{x}{\text{radius}}$$

$$\sin\theta = \frac{y}{\text{radius}}$$

Cosine is negative

Sine is positive

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

Tangent is negative

Do you think that Sine's best friend (Cosecant) would be positive also?

YES!! Because Cosecant is

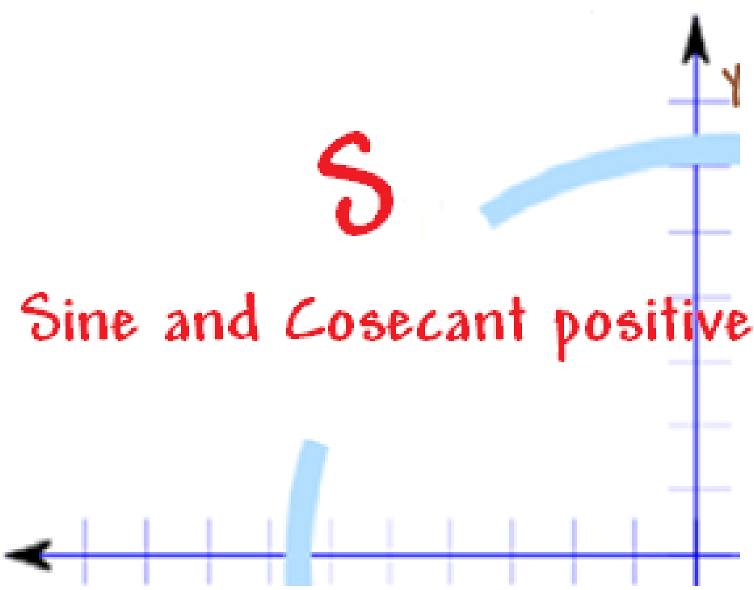
$$\csc\theta = \frac{\text{radius}}{y}$$

So what a minute this means…

Quadrant 2

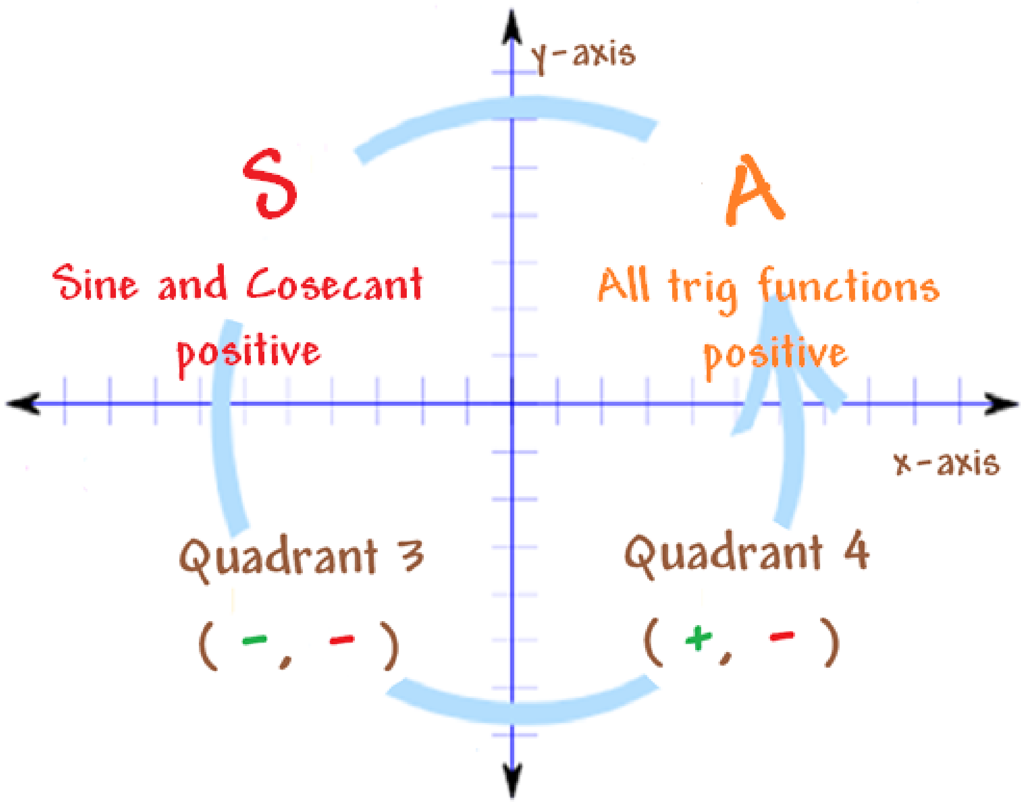
ONLY Sine and Cosecant are positive

So let's put a big ole 'S' in quadrant 2 for 'Sine' and its best friend Cosecant'

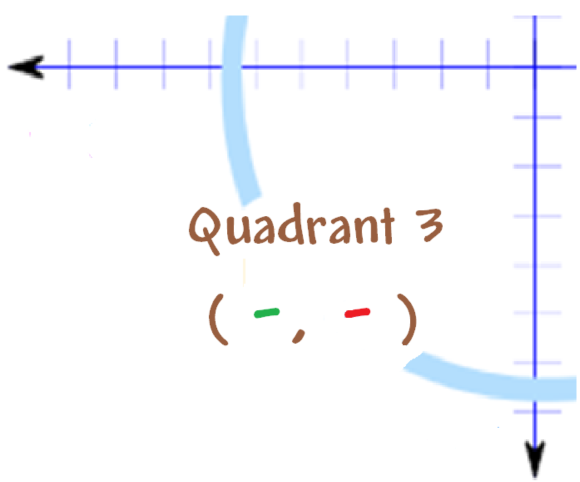


Quadrant 3

Let's take a look at our quadrants for a moment



In particular let's focus on quadrant 3



What do you see?

(- , -)

X is negative

Y is negative

$$\cos\theta = \frac{x}{\text{radius}}$$

$$\sin\theta = \frac{Y}{\text{radius}}$$

Cosine is negative

Sine is negative

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

Tangent is positive

Do you think that Tangent's best friend (Cotangent) would be positive also?

YES!! Because Cotangent is

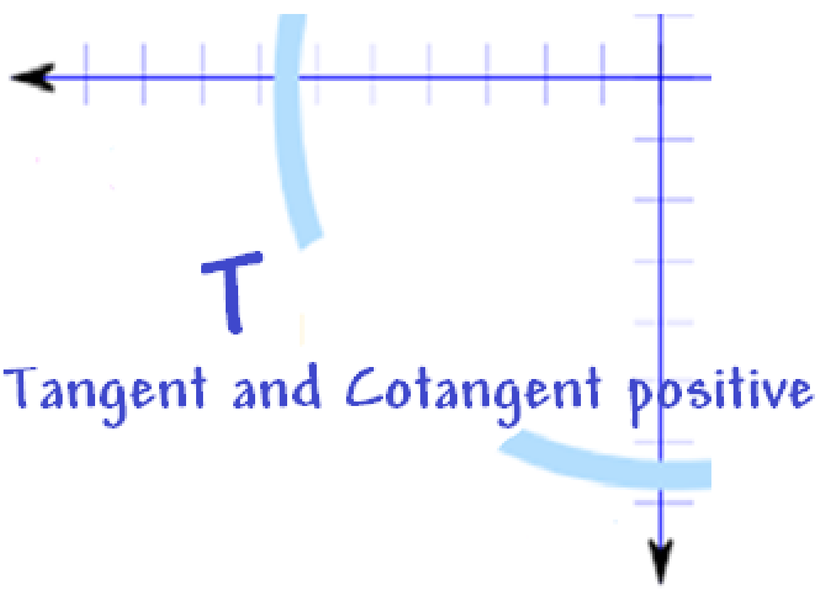
$$\cot\theta = \frac{x}{y}$$

So what a minute this means…

Quadrant 3

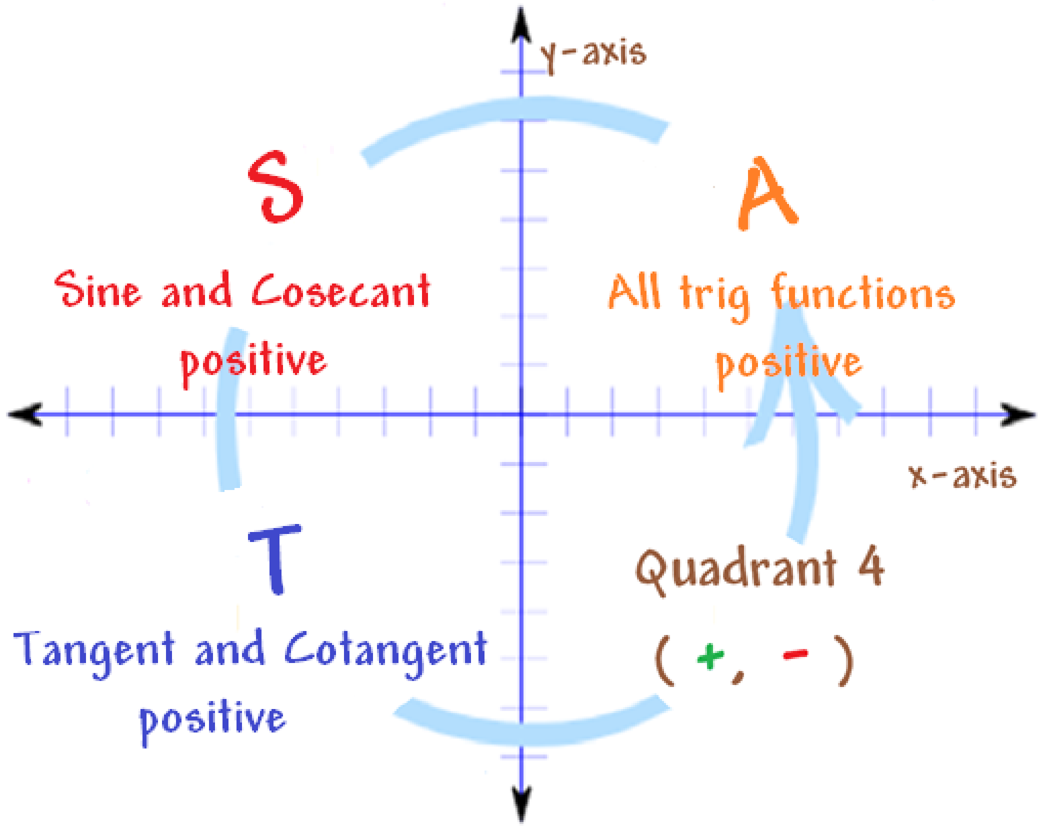
ONLY Tangent and Cotangent are positive

So let's put a big ole 'T' in quadrant 3 for 'Tangent' and its best friend Cotangent

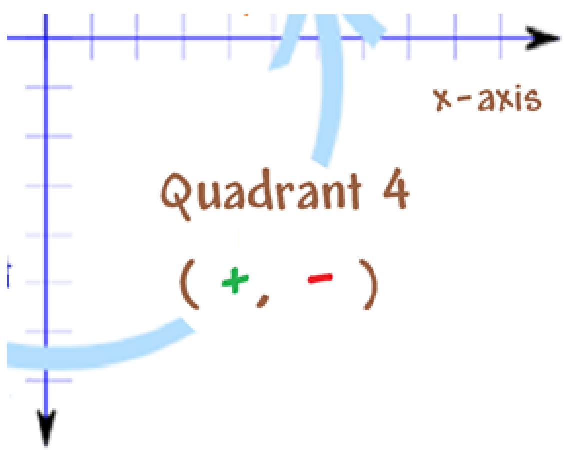


Quadrant 4

Let's take a look at our quadrants for a moment



In particular let's focus on quadrant 4



What do you see?

$(+ , -)$

X is positive

Y is negative

$$\cos\theta = \frac{x}{\text{radius}}$$

$$\sin\theta = \frac{y}{\text{radius}}$$

Cosine is positive

Sine is negative

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

Tangent is negative

Do you think that Cosine's best friend (Secant) would be positive also?

YES!! Because Secant is

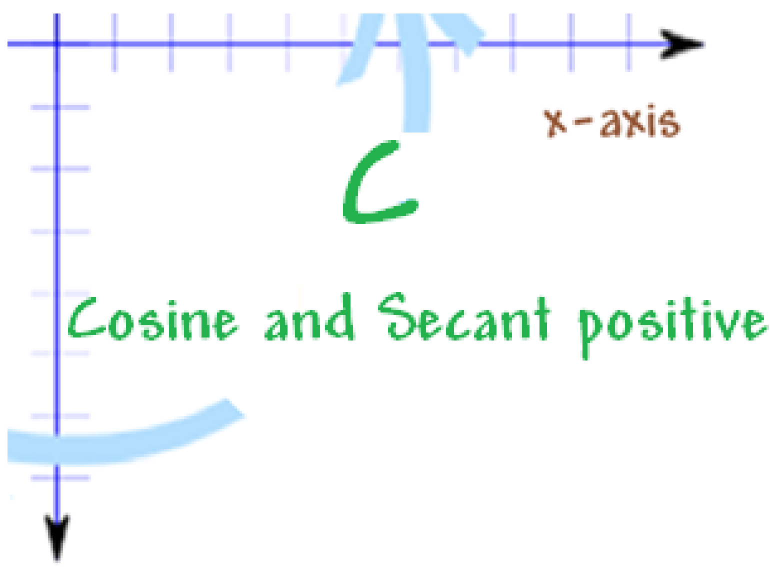
$$\sec\theta = \frac{\text{radius}}{x}$$

So what a minute this means…

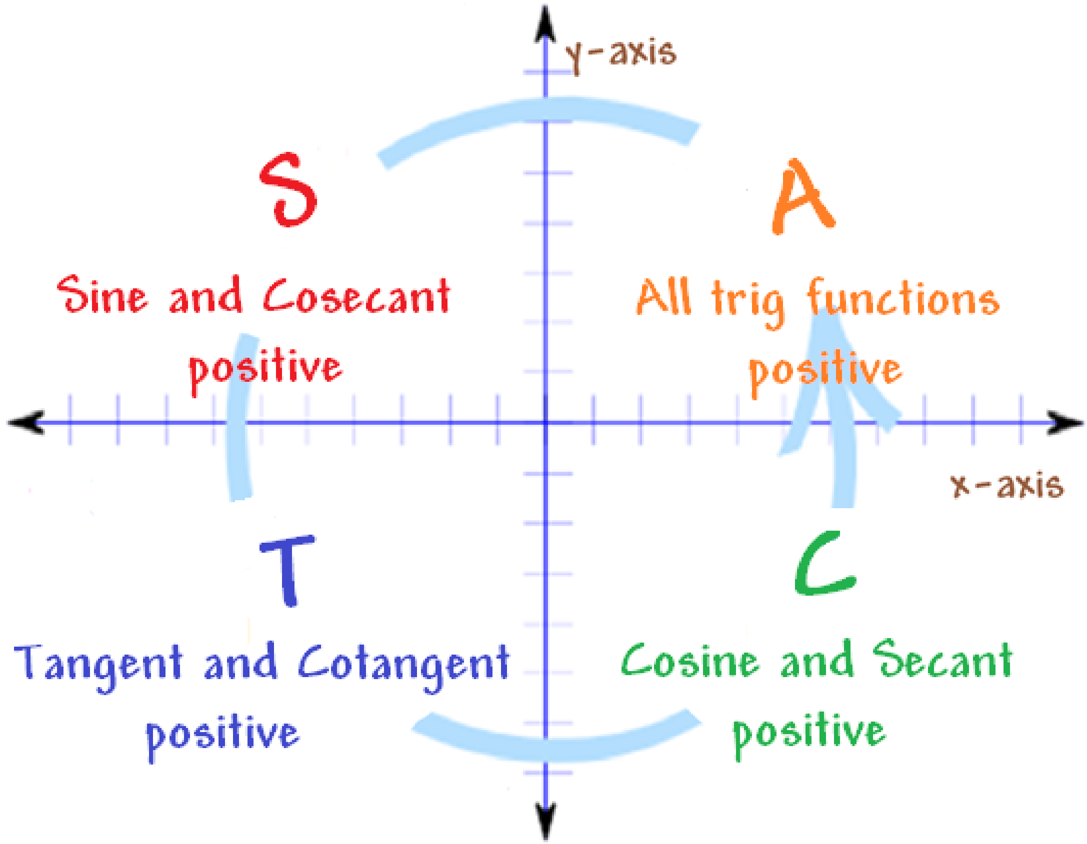
Quadrant 4

ONLY Cosine and Secant are positive

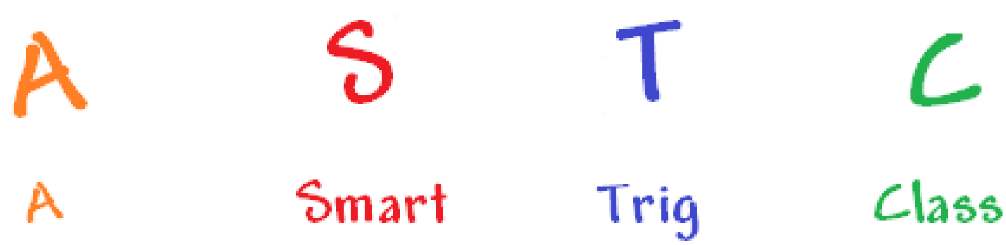
So let's put a big ole 'C' in quadrant 3 for 'Cosine' and its best friend Secant

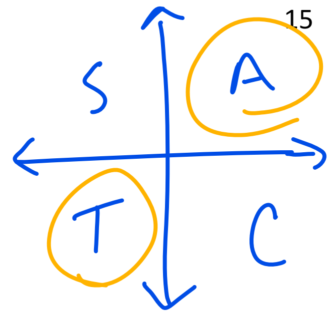


SO here is what we have.



How in the world am I going to remember this?

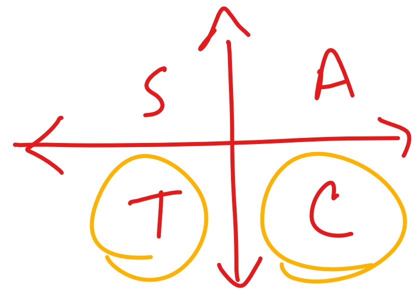




Check it Out:

What quadrant does θ live?

tangent positive $\tan\theta > 0$



csc negative $\csc\theta < 0$

Easy! Let's just see where they both can happen

$\tan\theta > 0$ $\csc\theta < 0$

Tangent positive	Cosecant negative
Quadrant 1 or Quadrant 3	Quadrant 3 or Quadrant 4

θ lives in Quadrant 3

Let's try another one

Find $\cos\theta$ **given:**

$$\sin\theta = \frac{20}{25}$$ **and** θ **lives in Quadrant 2**

Easy! Just list what you know and what you need

$$\sin\theta = \frac{20}{25} = \frac{y}{\text{radius}} \rightarrow$$

$y = 20$

$r = 25$

θ **lives in Quadrant 2** $\rightarrow$

$x = -$ (negative)

$y = +$ (positive)

Beautiful! We have y and r lets go find x: USE YOUR EQUATION!

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

Plug in your values and solve

Just remember $X = -$ (negative)

$$r^2 = X^2 + Y^2$$

$$25^2 = X^2 + 20^2$$

$$625 = X^2 + 400$$

$$625 - 400 = X^2$$

$$225 = X^2$$

$$\sqrt{225} = X$$

$$\pm 15 = X \leftarrow X = - \text{ (negative)}$$

$X = -15$ $Y = 20$ $r = 25$

$$\cos\theta = \frac{x}{\text{radius}} = \frac{-15}{25} = \frac{-3}{5}$$