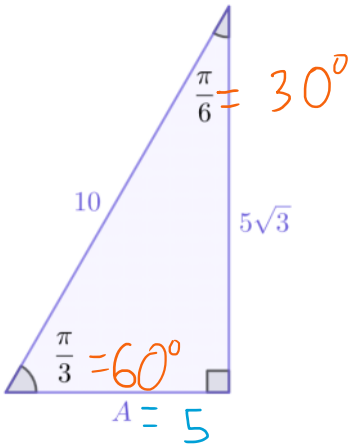
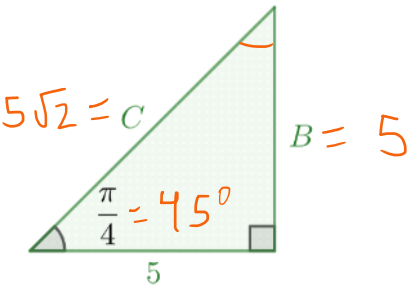
Warm-up!





A) Convert the three labelled angles to degrees.

B) Try to use your geometry knowledge to find A, B, and C.

Trig Functions, Day 2:
- 6 Trig Functions
- Points on Circles in Planes

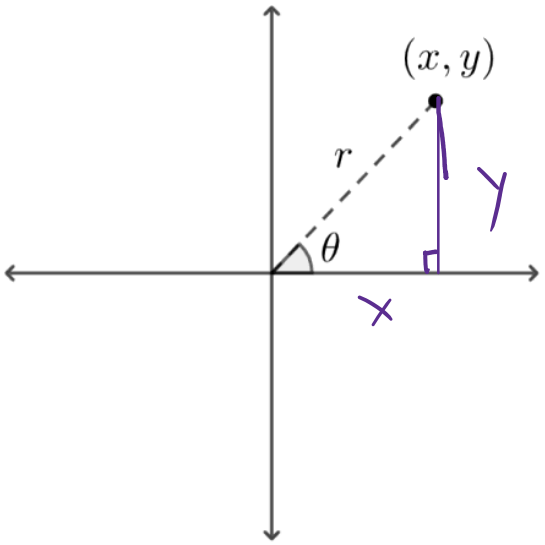
Homework
- Intro to Trig Functions Worksheet

Speed Quiz Next Class:
- 6 Trig Functions
- , –, and
- 10 questions
- 5 minutes

Definition of Trig Formulas

SOHCAHTOA

If the terminal ray of the angle θ graphed in standard form passes through (x, y), then...



$$r = \sqrt{x^2 + y^2}$$

$\sin(\theta) = \frac{y}{r}$ $\quad$ $\csc(\theta) = \frac{r}{y}$

$\cos(\theta) = \frac{x}{r}$ $\quad$ $\sec(\theta) = \frac{r}{x}$

$\tan(\theta) = \frac{y}{x}$ $\quad$ $\cot(\theta) = \frac{x}{y}$

Definition of Trig Formulas

If the terminal ray of the angle θ graphed in standard form passes through (x, y), then...

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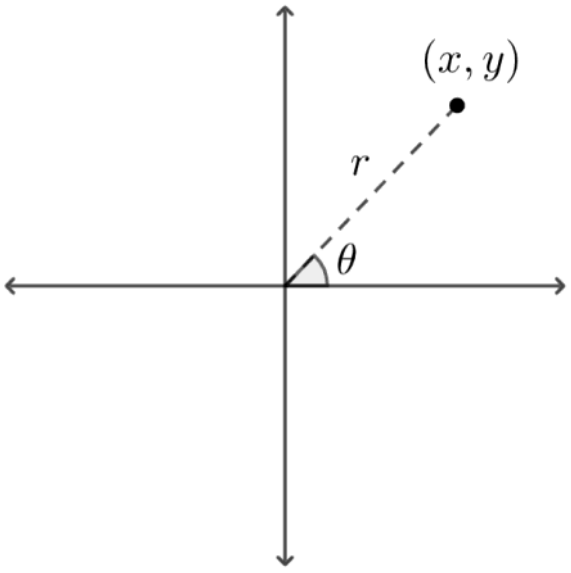


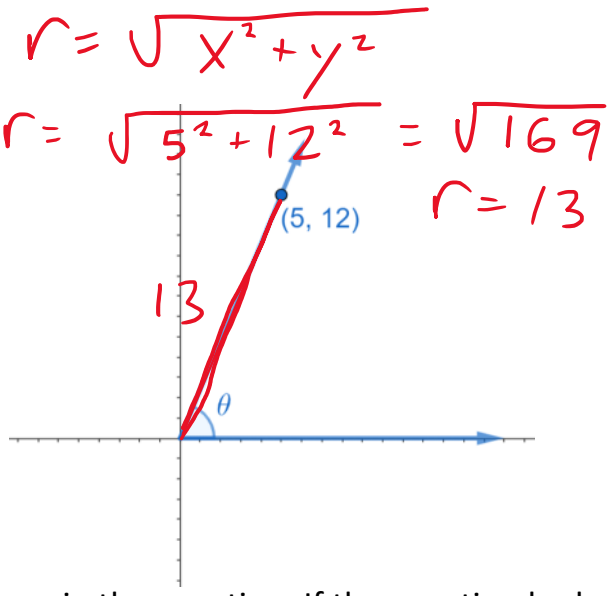
$\sin(\theta) =$ $\csc(\theta) =$

$\cos(\theta) =$ $\sec(\theta) =$

$\tan(\theta) =$ $\cot(\theta) =$

Let's practice that together once before you try on your own

When graphed in standard form, the terminal ray of the angle θ passes through the point $(5,12)$.



Find $\sin\theta = \frac{y}{r} = \frac{12}{13}$

Find $\csc\theta = \frac{13}{12}$

Find $\cos\theta = \frac{x}{r} = \frac{5}{13}$

Find $\sec\theta = \frac{13}{5}$

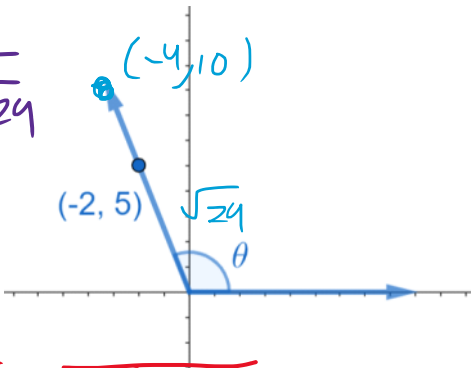
Find $\tan\theta = \frac{y}{x} = \frac{12}{5}$

Find $\cot\theta = \frac{5}{12}$

Note: It does not matter which point on the terminal ray is given in the question. If the question had given the point $(2.5, 6)$, all these ratios would still come out the same.

Try on your own

When graphed in standard form, the terminal ray of the angle θ passes through the point $(-2,5)$.



Find $\sec\theta$ $= -\frac{\sqrt{29}}{2}$

Find $\csc\theta$ $= \frac{\sqrt{29}}{5}$

Find $\cot\theta$ $= -\frac{2}{5}$

Find $\cos\theta$ $= \frac{x}{r} = -\frac{2}{\sqrt{29}}$

Find $\sin\theta$ $= \frac{y}{r} = \frac{5}{\sqrt{29}} = \frac{5\cdot\sqrt{29}}{\sqrt{29}\cdot\sqrt{29}} = \frac{5\sqrt{29}}{29}$

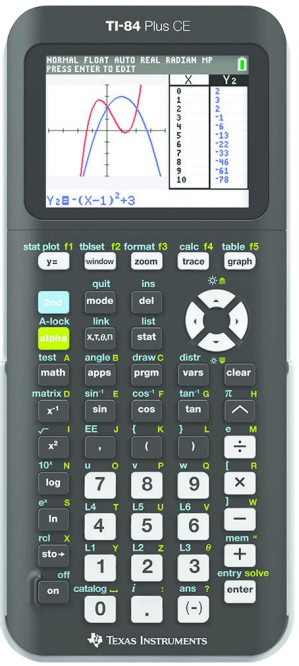
Find $\tan\theta$ $= \frac{y}{x} = -\frac{5}{2}$

$r = \sqrt{x^2 + y^2}$

$r = \sqrt{(-2)^2 + 5^2} = \sqrt{29}$

Note: It does not matter which point on the terminal ray is given in the question. If the question had given the point $(-20, 50)$, all these ratios would still come out the same.

In the dark ages, we looked up trig ratios in tables. Then, Desmos.com was invented. Historians generally consider this the start of modern civilization.



$\sin\left(\frac{\pi}{5}\right) =$

$\cot(1.1) =$

$\cos(1.57) =$

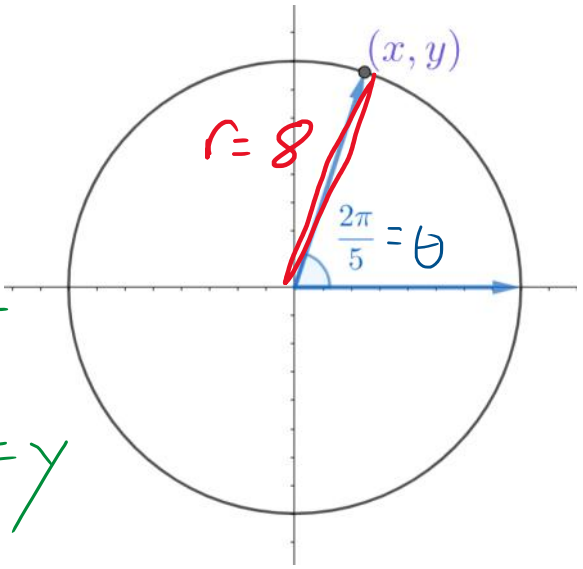
$\sec\left(-\frac{3\pi}{4}\right) =$

$\tan\left(-\frac{\pi}{3}\right) =$

$\csc\left(\frac{\pi}{5}\right) =$

We can use a calculator/Desmos to answer this

When graphed in standard form, the terminal ray of the angle $\frac{2\pi}{5}$ intersects a circle of radius 8 at the point (x, y). Find x and y.



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

$\cos\left(\frac{2\pi}{5}\right) = \frac{x}{8}$

$8 \cdot \cos\left(\frac{2\pi}{5}\right) = x$

$2.472 = x$

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

$\sin\left(\frac{2\pi}{5}\right) = \frac{y}{8}$

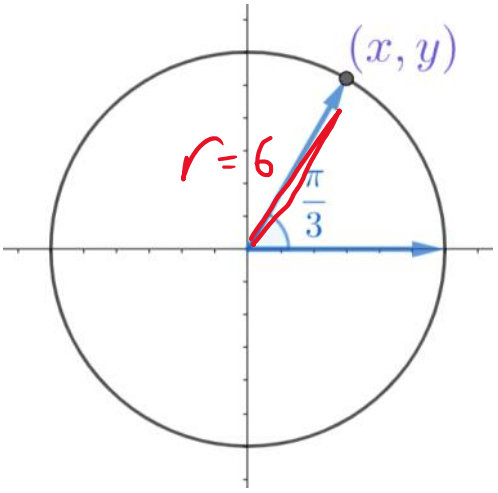
$8 \cdot \sin\left(\frac{2\pi}{5}\right) = y$

$7.608 = y$

Try a similar one

$\cos\frac{\pi}{3} = \frac{1}{2}$ $\sin\frac{\pi}{3} = \frac{\sqrt{3}}{2}$

When graphed in standard form, the terminal ray of the angle $\frac{\pi}{3}$ intersects a circle of radius 6 at the point (x, y). Find x and y.



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

$\cos\frac{\pi}{3} = \frac{x}{6}$ $\sin\frac{\pi}{3} = \frac{y}{6}$

$6 \cdot \cos\frac{\pi}{3} = x$ $6 \cdot \sin\frac{\pi}{3} = y$

$3 = x$ $5.196 = y$

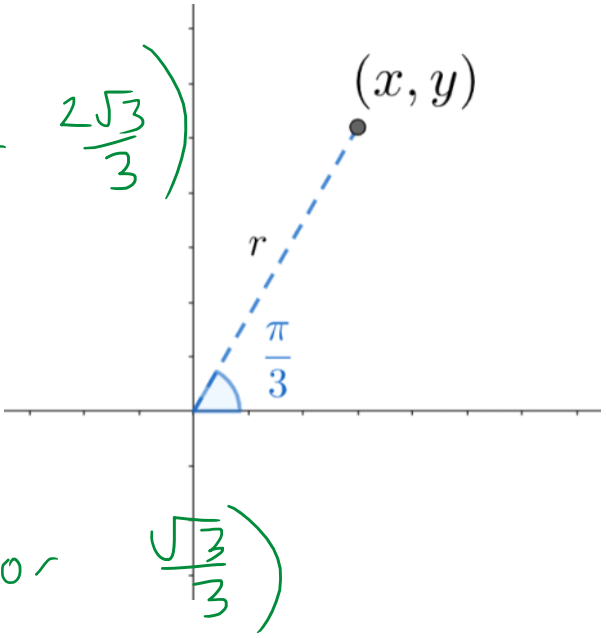
We don't actually need a calculator for angles like $\frac{\pi}{3}$

$\frac{\pi}{3}$ radians (AKA 60°)

$\sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$ $\quad$ $\csc\left(\frac{\pi}{3}\right) = \frac{2}{\sqrt{3}}$ $\left(\text{or } \frac{2\sqrt{3}}{3}\right)$

$\cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$ $\quad$ $\sec\left(\frac{\pi}{3}\right) = 2$

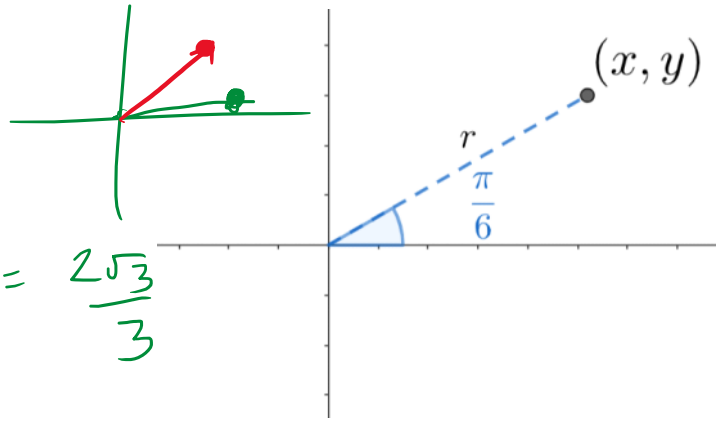
$\tan\left(\frac{\pi}{3}\right) = \sqrt{3}$ $\quad$ $\cot\left(\frac{\pi}{3}\right) = \frac{1}{\sqrt{3}}$ $\left(\text{or } \frac{\sqrt{3}}{3}\right)$



We don't actually need a calculator for angles like $\frac{\pi}{6}$

$\frac{\pi}{6}$ radians (AKA 30°)

$\sin\left(\frac{\pi}{6}\right) = \frac{1}{2}$ $\quad$ $\csc\left(\frac{\pi}{6}\right) = 2$



$\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$ $\quad$ $\sec\left(\frac{\pi}{6}\right) = \frac{2}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\tan\left(\frac{\pi}{6}\right) = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ $\quad$ $\cot\left(\frac{\pi}{6}\right) = \sqrt{3}$

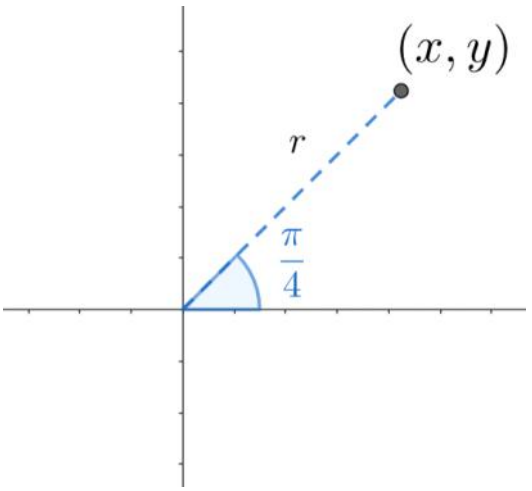
Perhaps easiest of all, we don't actually need a calculator for angles like $\frac{\pi}{4}$

$\frac{\pi}{4}$ radians (AKA 45°)

$\sin\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\quad \csc\left(\frac{\pi}{4}\right) = \sqrt{2}$

$\cos\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$ $\quad \sec\left(\frac{\pi}{4}\right) = \sqrt{2}$

$\tan\left(\frac{\pi}{4}\right) = 1$ $\quad \cot\left(\frac{\pi}{4}\right) = 1$



Quiz Next Class

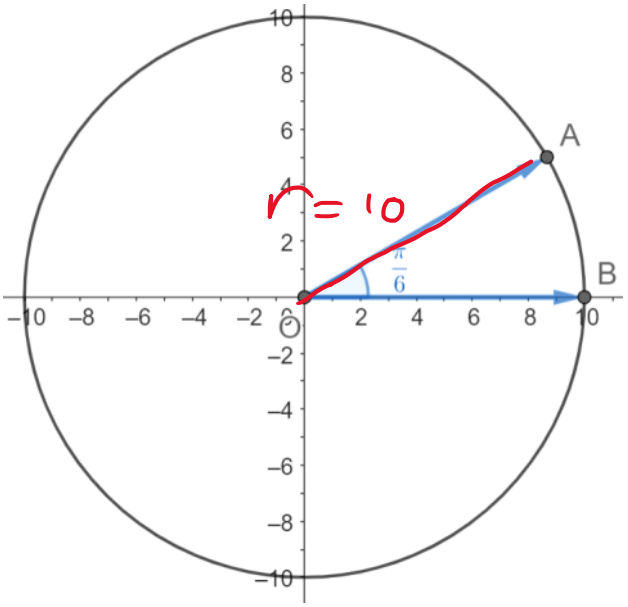
AP Precalculus Name_____ Date_____ Per_____

(10 pts) Trig Values/Unit Circle Speed Quiz

You have 5 minutes to answer these 10 questions. No Calculators. When I call time, drop your pencil and throw your hands in the air like Woody from Toy Story just said "Reach for the Sky!"

$\sin\left(\frac{\pi}{3}\right)$	$\sec\left(\frac{\pi}{6}\right)$
$\tan\left(\frac{\pi}{4}\right)$	$\csc\left(\frac{\pi}{6}\right)$
$\sec\left(\frac{\pi}{4}\right)$	$\sec\left(\frac{\pi}{3}\right)$
$\cos\left(\frac{\pi}{6}\right)$	$\sin\left(\frac{\pi}{6}\right)$
$\cos\left(\frac{\pi}{3}\right)$	$\cot\left(\frac{\pi}{4}\right)$

The figure gives a circle of radius 10 in the xy-plane centered at the origin. The terminal ray of the angle $\frac{\pi}{6}$ graphed in standard form intersects the circle at point A.



Find the coordinates of A.

$\cos\theta = \frac{x}{r}$ $\quad \sin\theta = \frac{y}{r}$

$\cos\frac{\pi}{6} = \frac{x}{10}$ $\quad \sin\frac{\pi}{6} = \frac{y}{10}$

$10 \cdot \cos\frac{\pi}{6} = x$ $\quad 10 \cdot \sin\frac{\pi}{6} = y$

$10 \cdot \frac{\sqrt{3}}{2} = x$ $\quad 10 \cdot \frac{1}{2} = y$

$5\sqrt{3} = x$ $\quad 5 = y$

Find the slope of the ray $\overrightarrow{OA}$

$\tan\frac{\pi}{6} = \frac{1}{\sqrt{3}} = \frac{\sqrt{3}}{3}$

Meet θ's Friends

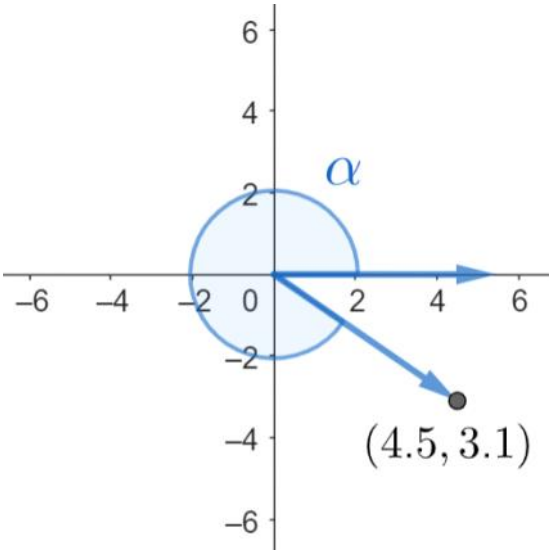
Alpha: α 

Beta: β 

Like θ, these are sometimes used as the name of a variable that represents an angle.

Like how we might sometimes use a and b as variables for numbers instead of x.

When graphed in standard form, the terminal ray of angle α passes through the point $(4.5, -3.1)$.



Find $\sin \alpha$

Find $\cos \alpha$

Find $\tan \alpha$

Find $\sec \alpha$

Find $\csc \alpha$

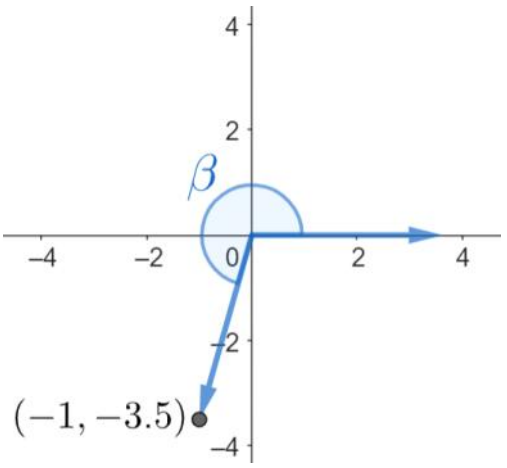
Find $\cot \alpha$

When graphed in standard form, the terminal ray of angle β passes through the point $(-1, -3.5)$.

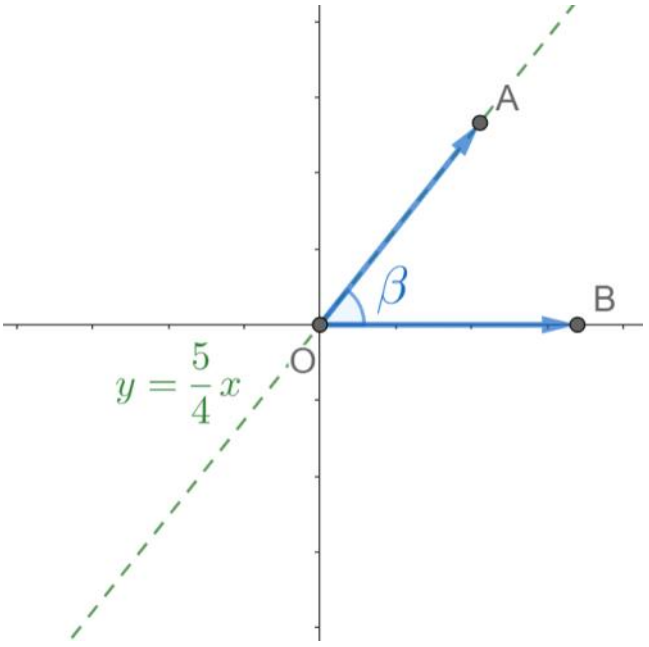
Find $\cos \beta$

Find $\tan \beta$

Find $\sec \beta$



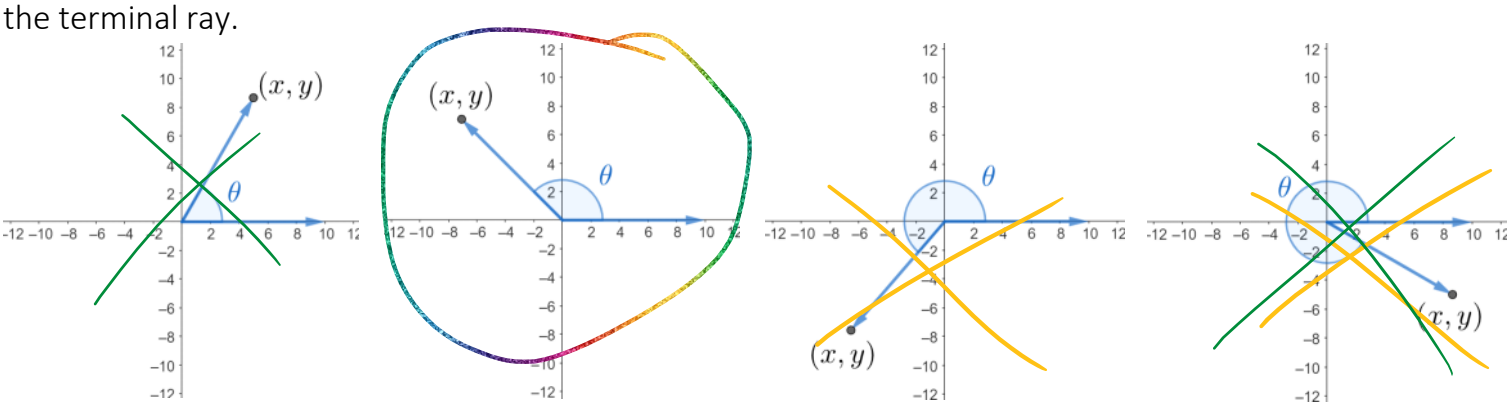
When graphed in standard form, the terminal ray of the angle β passes through point A. The slope of the line passing through A and the origin is $\frac{5}{4}$.



Find $\tan\beta$ = $\frac{5}{4}$

Find $\cot\beta$ = $\frac{4}{5}$

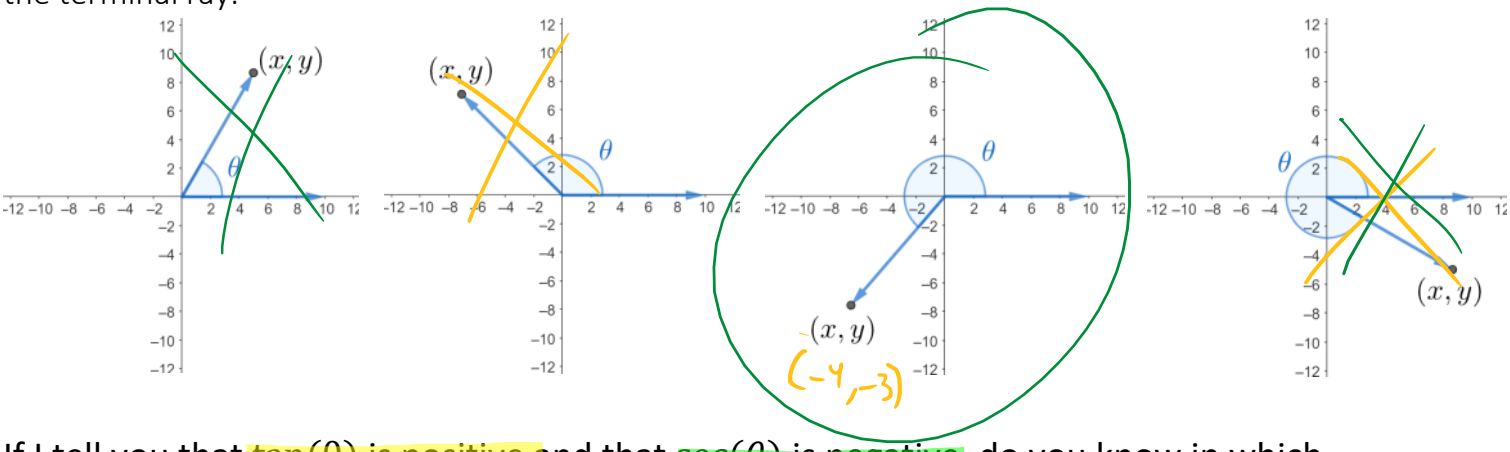
When the angle θ is graphed in standard form, the point (x, y) is on the terminal ray.



If I tell you that $\sin(\theta)$ is positive and that $\cos(\theta)$ is negative, do you know in which quadrant the terminal ray of θ lies?

$\frac{y}{r}$ $\frac{x}{r}$

When the angle θ is graphed in standard form, the point (x, y) is on the terminal ray.



If I tell you that tan(θ) is positive and that sec(θ) is negative, do you know in which quadrant the terminal ray of θ lies?

$\frac{y}{x}$ positive $\frac{r}{x}$ negative