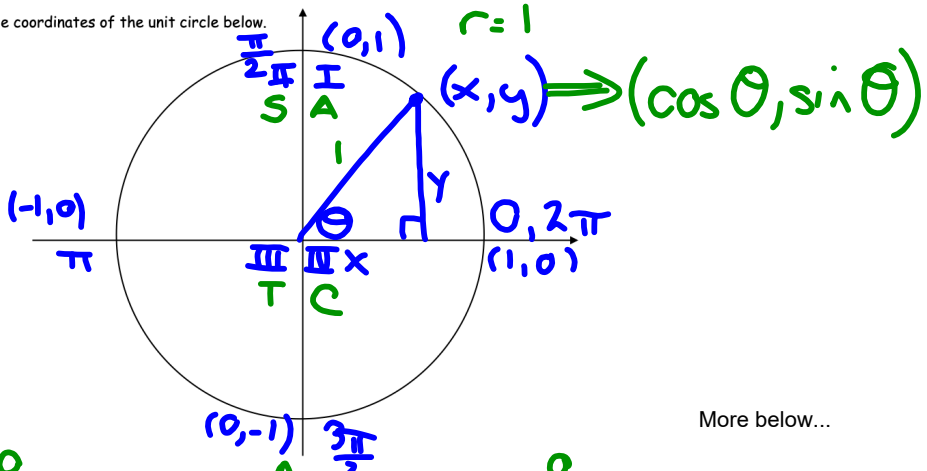
Radian Trig

No Calculators this Unit!

Dec 29-8:47 PM

Unit Circle → A circle, centered at the origin with a radius of 1.

Label the coordinates of the unit circle below.

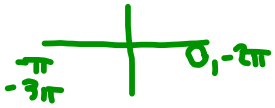


More below...

$\sin\theta = \frac{y}{1} : y$ $\left(\frac{O}{H}\right)$ $\cos\theta = \frac{x}{1} : x$ $\tan\theta = \frac{y}{x}$ $\left(\frac{O}{A}\right)$

Find each of the following trig values using your unit circle:

1. $\sin\pi = 0$ (y)
2. $\cos(\pi/2) = 0$ (x)
3. $\tan\pi = \frac{0}{1} : 0$ $\left(\frac{y}{x}\right)$
4. $\sin(3\pi/2) = -1$ (y)
5. $\cos\pi = -1$ (x)
6. $\tan(-3\pi) = \frac{0}{1} : 0$
7. $\tan\frac{3\pi}{2} : \frac{-1}{0} : \text{undefined}$



Dec 29-9:01 PM

7. a. Verify $\left(\frac{2}{\sqrt{13}}, -\frac{3}{\sqrt{13}}\right)$ is a point on the unit circle.

$r = 1$

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

$\left(\frac{2}{\sqrt{13}}\right)^2+\left(\frac{-3}{\sqrt{13}}\right)^2=1^2$

$\frac{4}{13}+\frac{9}{13}=1$

$1=1$

b. Assume that the terminal side of angle t radians passes through the point $\left(\frac{2}{\sqrt{13}}, -\frac{3}{\sqrt{13}}\right)$ on the unit circle. Find sin t, cos t, and tan t in simplest radical form.

$(\cos\theta, \sin\theta)$

$r = 1$

$\sin t = -\frac{3}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = -\frac{3\sqrt{13}}{13}$

$\cos t = \frac{2}{\sqrt{13}} \cdot \frac{\sqrt{13}}{\sqrt{13}} = \frac{2\sqrt{13}}{13}$

$\tan t = \frac{y}{x} = \frac{-3}{\sqrt{13}} \cdot \frac{\sqrt{13}}{2} = \frac{-3}{2}$

Dec 29-9:03 PM

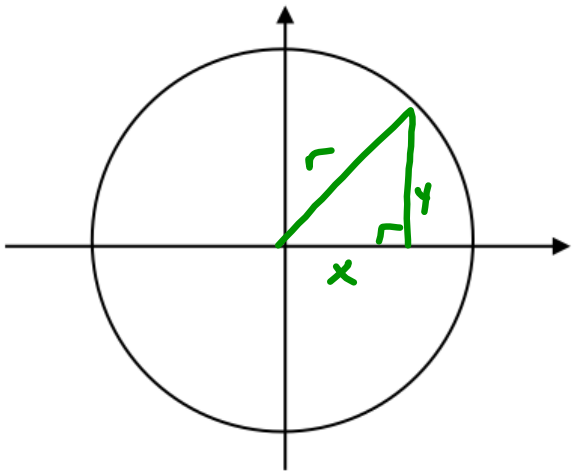
What if the circle has a radius $\neq 1$? Let's call it "r"

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

$\sin\theta = \frac{O}{H} \cdot \frac{y}{r}$

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

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



Dec 29-9:04 PM

Find sin t, cos t, and tan t in simplest radical form when the terminal side of an angle of t radians in standard position passes through the given point.

8. $(5, 3)$ (x,y) $r = \sqrt{5^2+3^2} = \sqrt{25+9} = \sqrt{34}$ $r \neq 1$

$\sin t = \frac{y}{r} = \frac{3}{\sqrt{34}} = \frac{3\sqrt{34}}{34}$ $\cos t = \frac{x}{r} = \frac{5}{\sqrt{34}} = \frac{5\sqrt{34}}{34}$ $\tan t = \frac{y}{x} = \frac{3}{5}$

9. $(-1, 6)$ $r = \sqrt{1+36} = \sqrt{37}$

$\sin t = \frac{6}{\sqrt{37}} = \frac{6\sqrt{37}}{37}$ $\cos t = \frac{-1}{\sqrt{37}} = -\frac{\sqrt{37}}{37}$ $\tan t = -6$

10. $(\sqrt{7}, -2)$ $r = \sqrt{7+4} = \sqrt{11}$

$\sin t = \frac{-2}{\sqrt{11}} = -\frac{2\sqrt{11}}{11}$ $\cos t = \frac{\sqrt{7}}{\sqrt{11}} = \frac{\sqrt{77}}{11}$ $\tan t = \frac{-2}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = -\frac{2\sqrt{7}}{7}$

Dec 29-9:05 PM

Jan 2-9:37 AM