Review

Evaluate the trigonometric expression:

$\sin(-120°) =$ $-\frac{\sqrt{3}}{2}$

$\sec 180° =$ -1

$\cos 225° =$ $-\frac{1}{\sqrt{2}}$

$\csc 330° =$ -2

$\tan(-270°) =$ undefined

$\cot 135° =$ -1

Convert to degrees:

$\frac{3\pi}{4} \cdot \frac{180°}{\pi} =$ $135°$

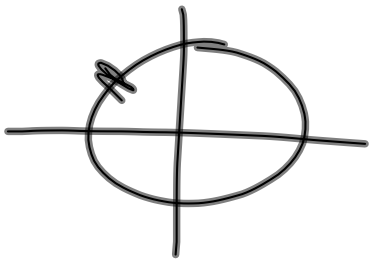
$\frac{4\pi}{3} \cdot \frac{180°}{\pi} =$ $240°$

$\frac{11\pi}{6} \cdot \frac{180°}{\pi} =$ $330°$

$-\frac{5\pi}{2} \cdot \frac{180°}{\pi} =$ $-450°$

Homework questions?

24.



$\pi \approx 3.14$

$\frac{\pi}{2} \approx 1.57$

Common angles:
(memorize!)

$\frac{\pi}{6} = 30°$

$\frac{\pi}{4} = 45°$

$\frac{\pi}{3} = 60°$

Note:

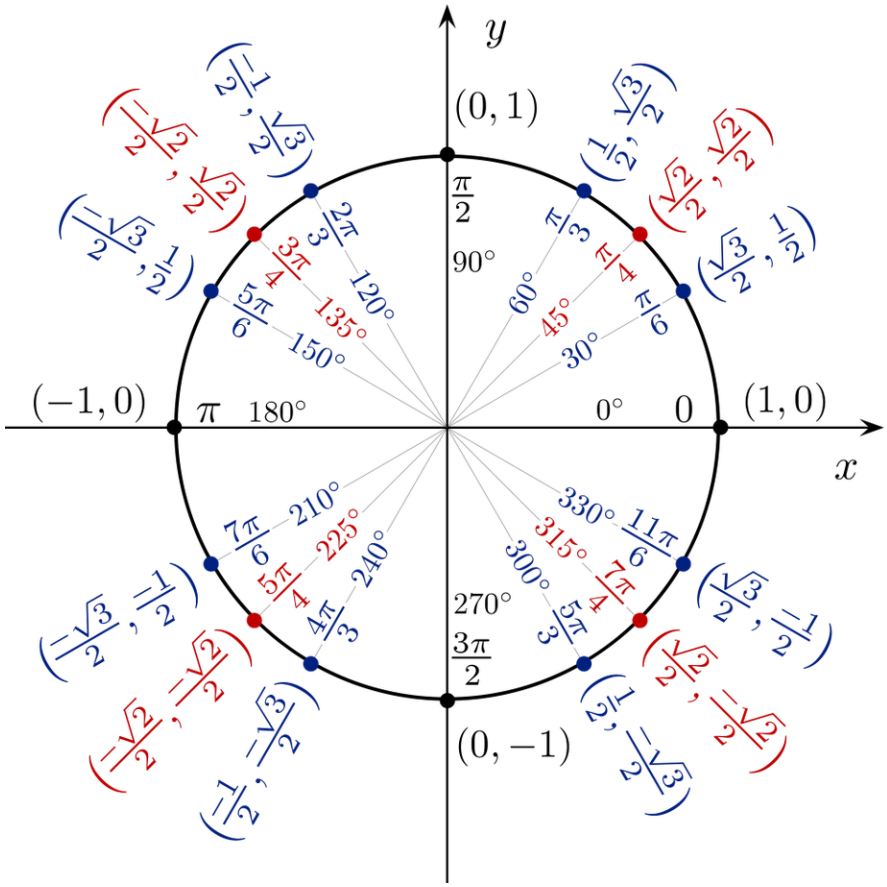
$\frac{k\pi}{6} \rightarrow 30° \; ref.\angle$

$\frac{k\pi}{4} \rightarrow 45° \; ref.\angle$

$\frac{k\pi}{3} \rightarrow 60° \; ref.\angle$

$\frac{k\pi}{2} \rightarrow 90° \; or \; 270°$

$k\pi \rightarrow 0° \; for \; k \; even;$
$180° \; for \; k \; odd$



Evaluate the trigonometric function of an angle given in radians

$\cos \frac{11\pi}{6} =$ $\frac{\sqrt{3}}{2}$

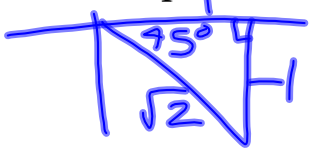
$\sin 329\pi =$ 0

$\tan \frac{7\pi}{2} =$ $\frac{-1}{0}$ undefined

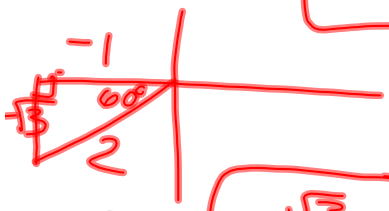
$\sec \frac{5\pi}{6} =$ $-\frac{2}{\sqrt{3}}$

$\cot\frac{3\pi}{4} =$ -1

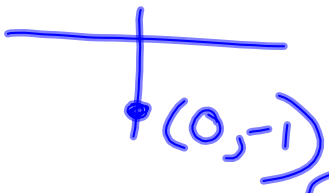
$\sec\frac{7\pi}{4} =$ $\sqrt{2}$



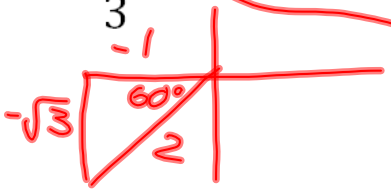
$\csc\left(-\frac{2\pi}{3}\right) =$ $-\frac{2}{\sqrt{3}}$



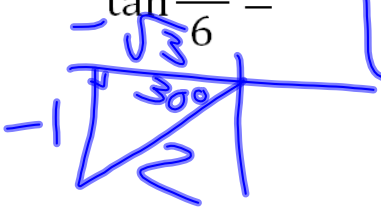
$\csc\frac{3\pi}{2} =$ -1



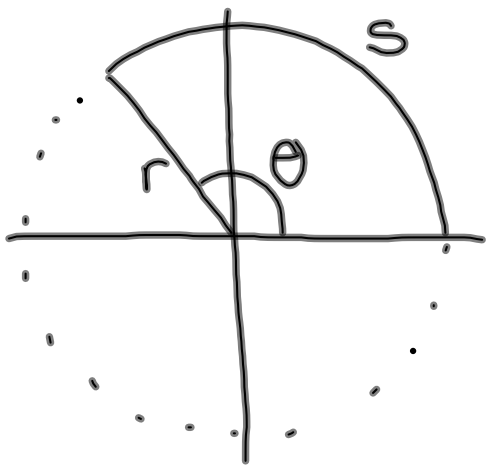
$\sin\frac{4\pi}{3} =$ $\frac{-\sqrt{3}}{2}$



$\tan\frac{7\pi}{6} =$ $\frac{1}{\sqrt{3}}$



5.4 Arc Length & Angular Speed



Arc Length

r = radius or distance from the center of rotation $(in, cm, km, etc.)$

s = arc length or distance traveled along the circumference of a circle $(in, cm, km, etc.)$

θ = angle or amount of rotation $(deg, rad, revolutions, etc.)$

$$\boxed{s = r\theta}$$

1. $r = 5in$; $\theta = 45°$; $s = ?\, in$

$s = r\theta$

$= \frac{5in}{1} \cdot \frac{45^{\circ}}{1} \cdot \frac{\pi}{180^{\circ}} = \frac{5\pi}{4}\, in$

2. $s = 16yards$; $\theta = 5$; $r = ?\, yards$

$s = r\theta$

$\frac{s}{\theta} = \frac{r\theta}{\theta}$

$r = \frac{s}{\theta} = \frac{16yd}{5}$

3. Find the measure of a rotation in radians when a point 2 meters from the center of rotation travels 4 meters.

$\theta = ?\, rad$; $r = 2m$; $s = 4m$

$s = r\theta$

$\frac{s}{r} = \frac{r\theta}{r}$

$\theta = \frac{s}{r} = \frac{4m}{2m} = 2$

Linear Speed

$$v = \frac{s}{t}$$

Angular Speed

$$\omega = \frac{\theta}{t}$$

ω = "omega"

Arc Length

$$s = r\theta$$

Relating Linear & Angular Speed

$$v = \frac{s}{t} = \frac{r\theta}{t} = r \cdot \frac{\theta}{t} = r\omega$$

$$v = r\omega$$

r = radius or distance from the center of rotation $(in, cm, km, etc.)$

s = arc length or linear distance along the circumference of a circle $(in, cm, km, etc.)$

θ = angle or amount of rotation $(deg, rad, revolutions, etc.)$

t = time $(sec, min, hours, years, etc.)$

$v = \frac{\text{linear distance}}{\text{time}}$ = linear speed $\left(\frac{km}{s}, \frac{mi}{h}, etc.\right)$

$\omega = \frac{\text{amount of rotation}}{\text{time}}$ = angular speed $\left(\frac{rev}{min}, \frac{deg}{s}, etc.\right)$

Handout Problems:

1. A wheel with a 15 inch diameter rotates at a rate of 6 radians per second. What is the linear speed of a point on its rim in feet per minute?

$r = \frac{15\text{ in}}{2}$; $\omega = \frac{6\text{ rad}}{s}$; $v = ?\ ft/min$

$v = r\omega$

$v = \frac{15\text{ in}}{2} \cdot \frac{6\text{ rad}}{s} \cdot \frac{1\text{ ft}}{12\text{ in}} \cdot \frac{60\text{ s}}{1\text{ min}} = 225\ ft/min$

2. An earth satellite in circular orbit 1200 km high makes one complete revolution every 90 minutes. What is its linear speed in km/min, given that the earth's radius is 6400 km?

3. Through how many radians does the minute hand of a clock rotate from 12:45pm to 1:25pm?

4. A car travels at 60 miles per hour. Its wheels have a 24 inch diameter. What is the angular speed of a point on the rim of a wheel in revolutions per minute?

Homework:

Evaluating trig functions of angles in radians:

5.5 #7-24 all (**super mega-important hw section!)