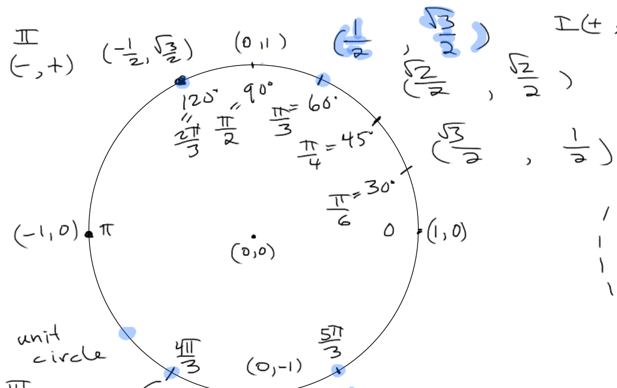
Thur. wk 1 — TRIG REVIEW



$$\boxed{x^2 + y^2 = 1}$$

radian = length (arc) determined by angle

Definition:
$\sin(t)$ = y-coord det. by t
$\cos(t)$ = x-coord " " t

$$\cos^2(t) + \sin^2(t) = 1$$

Pyth. Id

$$\sec(t) = \frac{1}{\cos(t)}$$

$$\csc(t) = \frac{1}{\sin(t)}$$

$$\tan(t) = \frac{\sin(t)}{\cos(t)} = \text{slope det. by } t$$

$$\cot(t) = \frac{1}{\tan(t)}$$

$$\sin(x+y) = \sin x \cos y + \sin y \cos x$$

$$\cos(x+y) = \cos x \cos y - \sin x \sin y$$

get Pyth. Id's for $\tan(t)$, $\csc(t)$, etc., via —

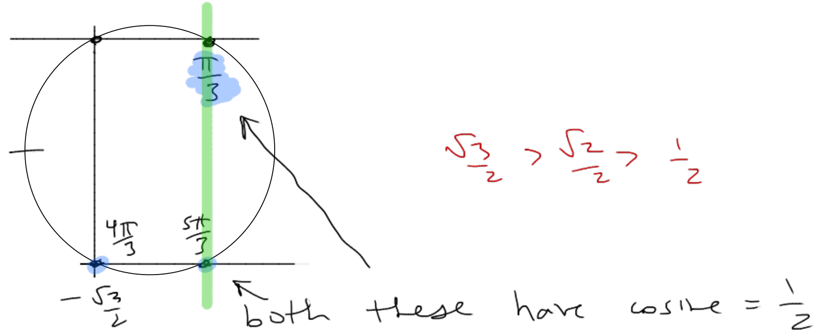
÷ by $\cos^2(t)$

$$\frac{\cos^2(t)}{\cos^2(t)} + \frac{\sin^2(t)}{\cos^2(t)} = \frac{1}{\cos^2(t)}$$

$$1 + \tan^2(t) = \sec^2(t)$$

Common Trig Exercises

Find all sol's in $[0, 2\pi)$



① $\sin(x) = \frac{-\sqrt{3}}{2}$

$\Rightarrow x = \frac{4\pi}{3}, \frac{5\pi}{3}$

$\frac{\sqrt{3}}{2} > \frac{\sqrt{2}}{2} > \frac{1}{2}$

② $\cos(5x) = \frac{1}{2}$

(i) Find the angle whose cosine $= \frac{1}{2}$

angle $= \frac{\pi}{3}, \frac{5\pi}{3}$

(ii) $\Rightarrow 5x = \frac{\pi}{3}$ or $5x = \frac{5\pi}{3}$ ✓

$x = \pi/5$ $\qquad x = \pi/3$

(3) Suppose angle θ is in QIII and $\cos\theta = -0.4$.

Find

neg in QIII

$\sin\theta = -\sqrt{0.84}$

$\tan\theta = \frac{-\sqrt{0.84}}{-0.4} =$

$\sec\theta = \frac{1}{\cos\theta} = \frac{1}{-0.4}$

$\csc\theta = \frac{1}{\sin\theta} = \frac{1}{-\sqrt{0.84}}$

use Pyth Id $\Rightarrow$ $\cos^2\theta + \sin^2\theta = 1$

$(-0.4)^2 + \sin^2\theta = 1$

$\sin^2\theta = 1 - (-0.4)^2$

$= 1 - 0.16$

$= \sqrt{0.84}$

$\sin\theta = \pm\sqrt{0.84}$

(4) If $\tan\theta = \frac{8}{15}$, then the Pyth. Id $\Rightarrow$

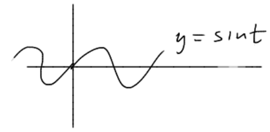
$$1 + \tan^2(t) = \sec^2(t)$$

$$\pm\sqrt{1 + \tan^2(t)} = \sec(t)$$

$$\frac{1}{\cos t} = \sec(t) = \pm\sqrt{1 + \left(\frac{8}{15}\right)^2}$$

TRIG MODEL

$d(t) = 12 + A \cdot \sin\left(\frac{2\pi}{365} t\right)$



'' # daylight hours on day t, w/ $t = 0 \leftrightarrow 3/22$

Goal: ① produce an exact formula for $d(t)$ (Find A) that corresponds to your hometown

② use that model to "find" how long the day is on your birthday.

Key: Need data point – look up "length of day on summer solstice in Hartselle, AL

- $\underbrace{14}_{\text{hours}}:\underbrace{27}_{\text{min}} = 14 + \frac{26}{60} = 14.43$
- what value of $t \leftrightarrow$ June 22 ? $\sim t \approx 90$.

$$14.43 = 12 + A \sin\left(\frac{2\pi}{365} \cdot 90\right) \Rightarrow A = \frac{14.43 - 12}{\sin\left(\frac{2\pi}{365} \cdot 90\right)} = 2.43$$

$d(t) = 12 + 2.43 \sin\left(\frac{2\pi}{365} t\right)$

$d(120) = 12 + 2.43 \cdot \sin\left(\frac{2\pi}{365} \cdot 120\right)$ if your B-Day is on day 120