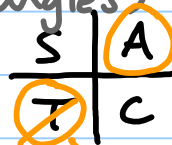


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TUE

# 5.5 (part 2) Trigonometric Functions

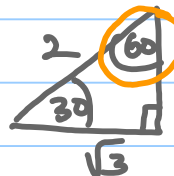
- solving an equation w/ multiple angles  
(twist: double & half angles)

Period:  $\sin \& \cos \rightarrow 2\pi$   
 $\tan \rightarrow \pi$



Need ALL solutions:  
 $[0, 2\pi)$

ex 1)  $\tan 2x = \sqrt{3}$   
 $2x = \tan^{-1}(\sqrt{3})$



$\frac{\pi}{3}$  ref  $x$

redundant because the period is  $\pi$  (QIII)

QI:  $\frac{2x}{2} = \frac{\pi}{3} + \frac{\pi n}{2}$

$x = \frac{\pi}{6} + \frac{\pi n}{2}$

$n=0: \frac{\pi}{6} + \frac{\pi}{2} \cdot 0 = \frac{\pi}{6}$  ← QI

$n=1: \frac{\pi}{6} + \frac{\pi}{2} \cdot 1 = \frac{\pi}{6} + \frac{3\pi}{6} = \frac{4\pi}{6} = \frac{2\pi}{3}$  ← QII

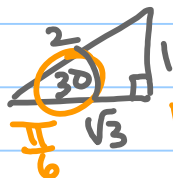
$n=2: \frac{\pi}{6} + \frac{\pi}{2} \cdot 2 = \frac{\pi}{6} + \pi = \frac{\pi}{6} + \frac{6\pi}{6} = \frac{7\pi}{6}$  ← QIII

$n=3: \frac{\pi}{6} + \frac{\pi}{2} \cdot 3 = \dots = \frac{5\pi}{2}$

$\frac{1\pi}{6}, \frac{4\pi}{6}, \frac{7\pi}{6}, \frac{10\pi}{6}$   
 ~~$\frac{13\pi}{6}$~~  done, more than  $2\pi$

ex 2)  $\sin \left(\frac{x}{3}\right) = \frac{1}{2}$

$\frac{x}{3} = \sin^{-1}\left(\frac{1}{2}\right)$



ref  $x$



3.  $\left[ \frac{x}{3} = \frac{\pi}{6} + 2\pi n \quad \text{or} \quad \frac{x}{3} = \frac{5\pi}{6} + 2\pi n \right]$

$x = \frac{\pi}{2} + 6\pi n \quad \text{or} \quad x = \frac{5\pi}{2} + 6\pi n$  more than  $2\pi$

$n=0: x = \frac{\pi}{2}$

~~$n=1: x = \frac{\pi}{2} + 6\pi$~~

★ ex 3)

$\sin x \cos x = -\frac{1}{2}$

$2 \sin x \cos x = 2\left(-\frac{1}{2}\right)$

$\sin 2x = -1$

$2x = \sin^{-1}(-1)$

$\frac{2x}{2} = \frac{3\pi}{2} + \frac{2\pi n}{2}$

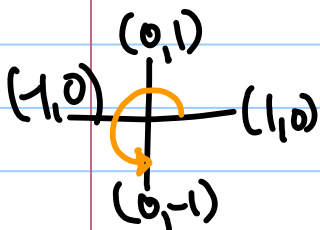
$x = \frac{3\pi}{4} + \pi n$

Trick: create a recognizable trig ID.

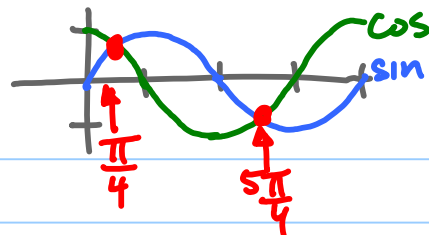
→ mult by 2

$n=0: \frac{3\pi}{4}$

$n=1: \frac{3\pi}{4} + \pi = \frac{7\pi}{4}$



ex 4)  $\cos x = \sin x$



$$\cos x - \sin x = 0$$

\* Square both sides

$$(\cos x - \sin x)^2 = 0^2$$

→ Check answers...

$$(\cos x - \sin x)(\cos x - \sin x) = 0$$

$$\cos^2 x - \cos x \sin x - \sin x \cos x + \sin^2 x = 0$$

$$1 - 2 \sin x \cos x = 0$$

\* double angle ID

$$1 - \sin 2x = 0$$

$$1 = \sin 2x$$

$$\sin 2x = 1$$

$$2x = \sin^{-1}(1)$$

$$\frac{2x}{2} = \frac{\pi}{2} + \frac{2\pi n}{2}$$

$$x = \frac{\pi}{4} + \pi n$$

$$n=0: \frac{\pi}{4}$$

$$n=1: \frac{\pi}{4} + \pi = \frac{5\pi}{4}$$

p. 636, # 26-38 even, 75, 76, 81, 82, 97, 98

