

1.6 Trig

2S 1-5

$$1. \sin^2 \theta = \frac{1 - \cos 2\theta}{2} = \frac{1}{2}(1 - \cos 2\theta)$$

$$2. \cos^2 \theta = \frac{1 + \cos 2\theta}{2}$$

$$3. \sin^2 x + \cos^2 x = 1$$

$$4. 1 + \cot^2 x = \csc^2 x$$

$$5. \tan^2 x + 1 = \sec^2 x$$

Aug 30-1:08 PM

Definitions

$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\csc \theta = \frac{\text{hyp}}{\text{opp}}$$

$$\cos \theta = \frac{\text{adj}}{\text{hyp}}$$

$$\sec \theta = \frac{\text{hyp}}{\text{adj}}$$

$$\tan \theta = \frac{\text{opp}}{\text{adj}}$$

$$\cot \theta = \frac{\text{adj}}{\text{opp}}$$

Unit Conversions

From radians to degrees: $\frac{180^\circ}{\pi}$


" degrees " radians: $\frac{\pi}{180^\circ}$

Aug 30-1:22 PM

Finding exact values

1. Unit Circle: special Δ s, reference angles
 $(x, y) \rightarrow (\cos\theta, \sin\theta)$

2. Special Δ s:



3. Memorize!

| | | | | | |
|--------------|---|----------------------|----------------------|----------------------|-----------------|
| | 0 | $\frac{\pi}{6}$ | $\frac{\pi}{4}$ | $\frac{\pi}{3}$ | $\frac{\pi}{2}$ |
| $\sin\theta$ | 0 | $\frac{1}{2}$ | $\frac{\sqrt{2}}{2}$ | $\frac{\sqrt{3}}{2}$ | 1 |
| $\cos\theta$ | 1 | $\frac{\sqrt{3}}{2}$ | $\frac{\sqrt{2}}{2}$ | $\frac{1}{2}$ | 0 |
| $\tan\theta$ | 0 | $\frac{1}{\sqrt{3}}$ | 1 | $\sqrt{3}$ | undef. |

(Note: The table above is a simplified version of the handwritten one. The handwritten one includes the formula $\frac{\sin\theta}{\cos\theta}$ for tan and the values $\frac{1}{2}$ and $\frac{1}{\sqrt{3}}$ for the first two tan entries.)

Aug 30-1:24 PM

1. $\frac{\sqrt{2}}{2}$

2. $-\frac{1}{2}$

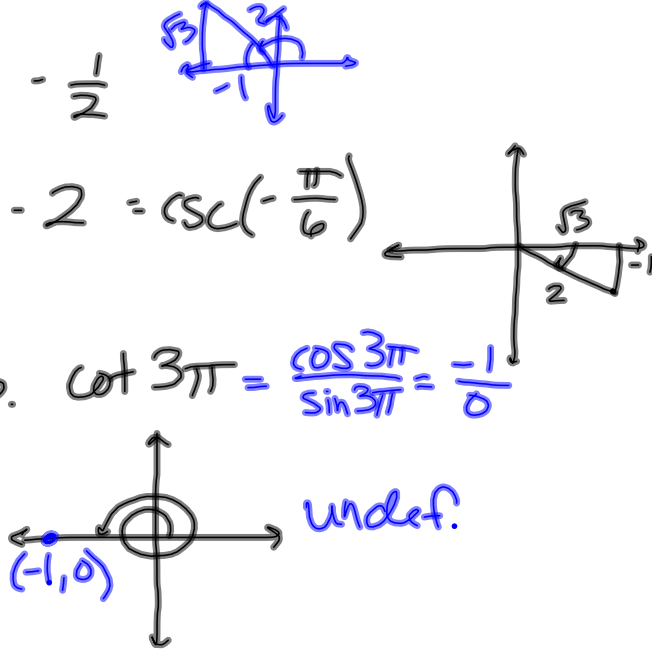
3. -1

4. $-2 = \csc(-\frac{\pi}{6})$

5. -2

6. $\cot 3\pi = \frac{\cos 3\pi}{\sin 3\pi} = \frac{-1}{0}$

undef.



Aug 30-1:46 PM

$$7. \sin^{-1} \frac{1}{2} = \frac{\pi}{6} \quad -\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$$

what angle has a sine of $\frac{1}{2}$?

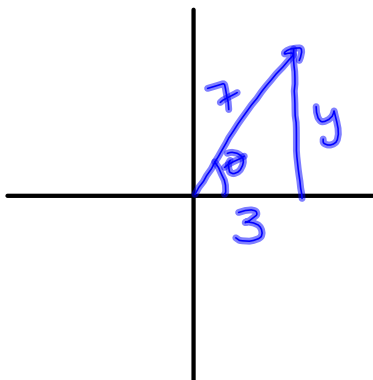
$$8. \cos^{-1} \left(-\frac{\sqrt{3}}{2} \right) = \frac{5\pi}{6}$$

$$0 \leq x \leq \pi$$

$$9. \tan^{-1} \sqrt{3} = \frac{\pi}{3}$$

Aug 30-1:49 PM

$$10. \sin \left(\cos^{-1} \frac{3}{7} \right) = \frac{\sqrt{40}}{7}$$

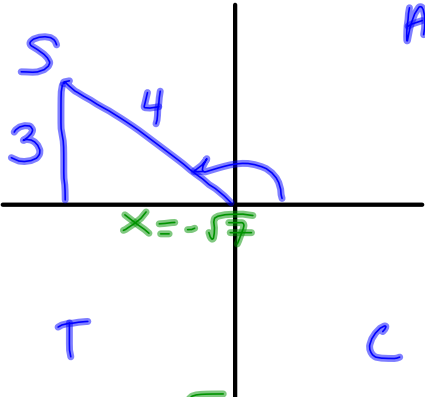


$$3^2 + y^2 = 7^2$$

$$y = \sqrt{40}$$

Aug 30-1:51 PM

$\text{II. } \sin \theta = \frac{3}{4} \quad \cos \theta < 0$
 $\csc \theta = \frac{4}{3}$



$x^2 + 3^2 = 4^2$
 $x = \pm \sqrt{7}$

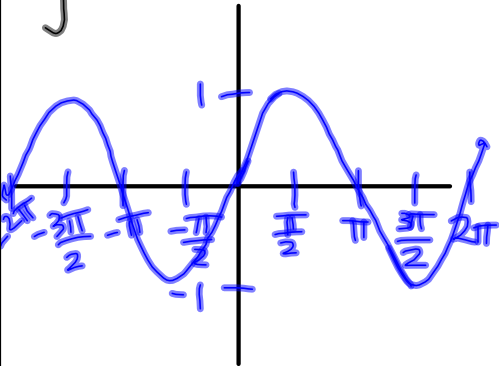
$\cos \theta = \frac{-\sqrt{7}}{4}$
 $\tan \theta = \frac{3}{-\sqrt{7}} = \frac{-3\sqrt{7}}{7}$

$\sec \theta = \frac{4}{-\sqrt{7}} = \frac{-4\sqrt{7}}{7}$
 $\cot \theta = \frac{-\sqrt{7}}{3}$

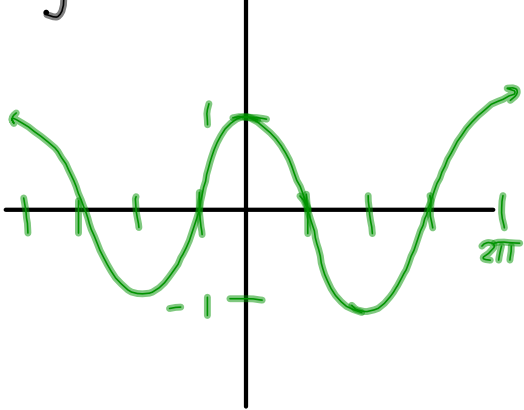
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Graphs

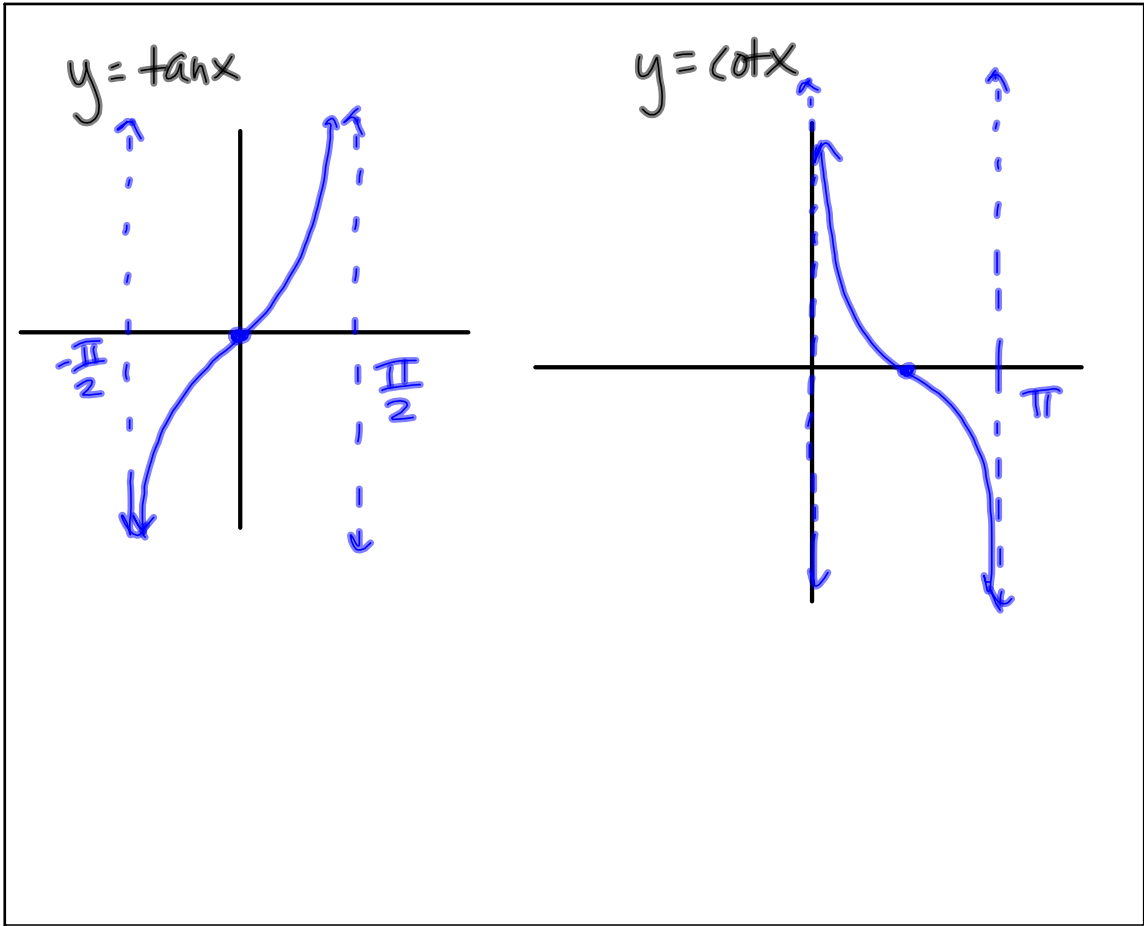
$y = \sin x$



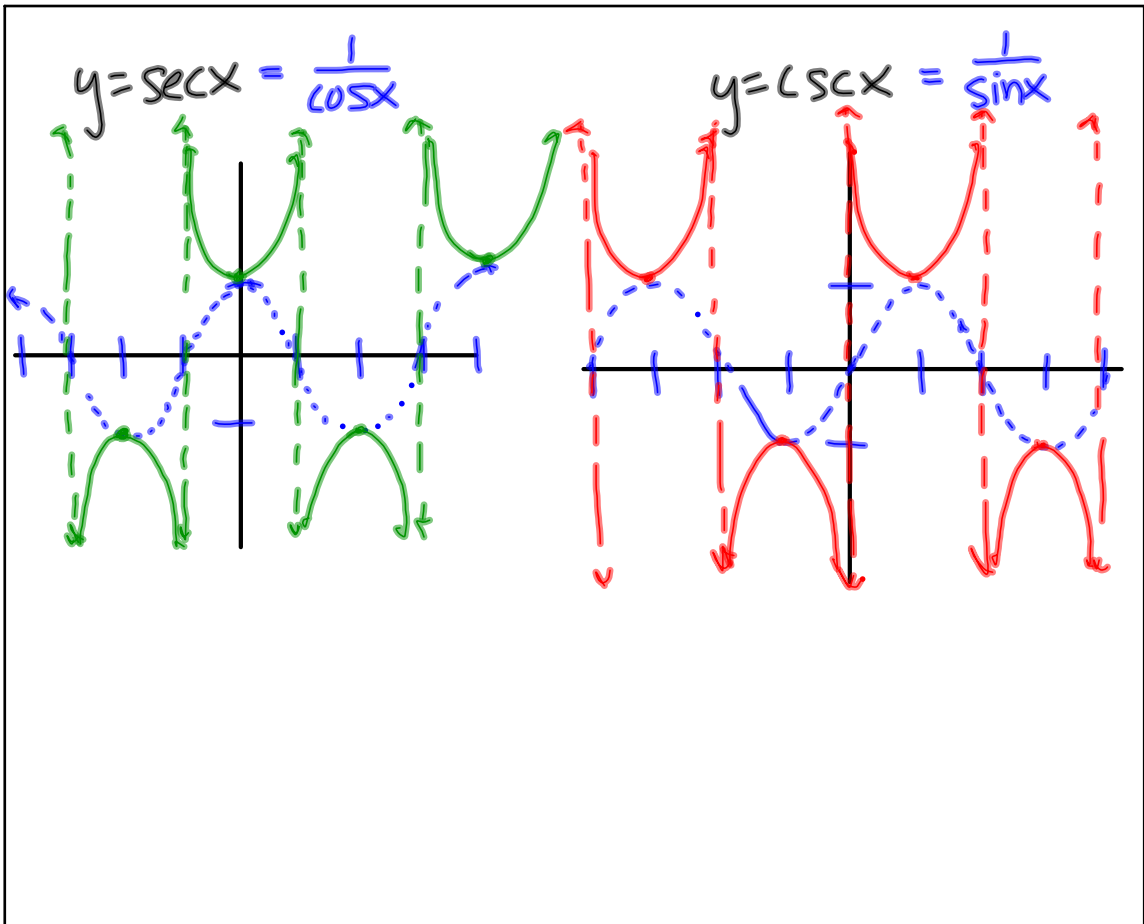
$y = \cos x$



Aug 30-1:58 PM



Aug 30-2:01 PM



Aug 30-2:04 PM

RS 45-49

$$45. y = A \overset{\text{cos}}{\sin}[B(x-c)] + D$$

A: amplitude

$$\text{Period: } \frac{2\pi}{|B|}$$

C: Phase Shift

D: Vertical Shift

Aug 30-2:07 PM

$$12. y = 2\sin\left(\underline{2x} + \frac{\pi}{3}\right)$$

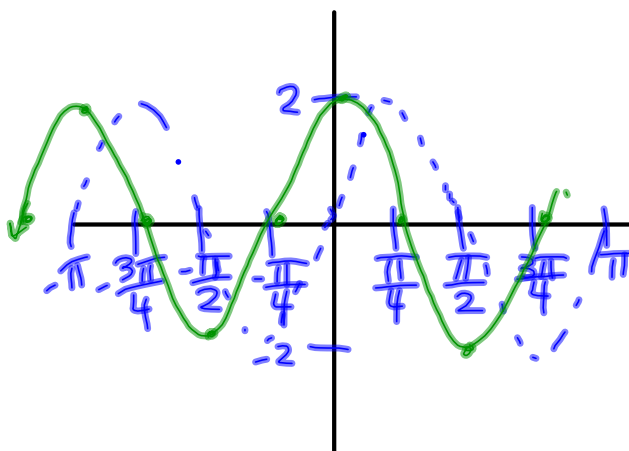
$$= 2\sin\left[2\left(x + \frac{\pi}{6}\right)\right]$$

$$A: 2$$

$$\text{Per: } \frac{2\pi}{2} = \pi$$

$$C: -\frac{\pi}{6}$$

$$D: \emptyset$$



Aug 30-2:09 PM

$$13. \tan^{-1} \tan x = .25 \quad 0 \leq x \leq 2\pi$$

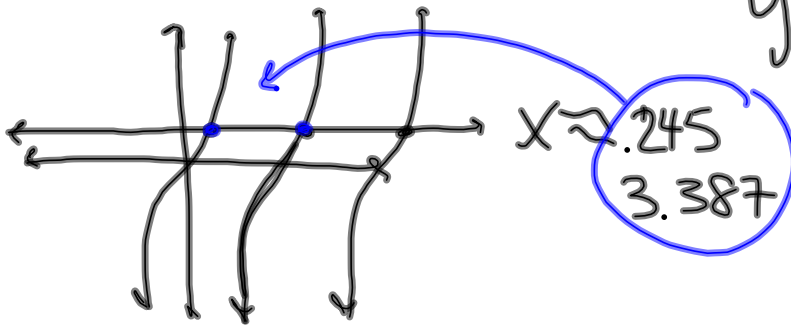
$$x = \tan^{-1} .25$$

$$\approx .245$$

OR graph $y = \tan x$

$$y = .25$$

find intersection



Aug 30-2:12 PM

$$14. \cos x = .5 \quad 0 \leq x \leq 2\pi$$

*no calc!

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

$$15. \cos x = .5 \quad -\infty < x < \infty$$

$$\text{From \#14: } x = \frac{\pi}{3}, \frac{5\pi}{3}$$

$$= \frac{\pi}{3} + 2\pi n, \frac{5\pi}{3} + 2\pi n$$

$$n \in \mathbb{Z}$$

Aug 30-2:21 PM