

Honors Math 3 - Trigonometry Review

① $\frac{3\pi}{10} \cdot \frac{180}{\pi} = 3(18) = 54^\circ$

② $\frac{5\pi}{12} \cdot \frac{180}{\pi} = 5(15) = 75^\circ$

③ $-\frac{2\pi}{9} \cdot \frac{180}{\pi} = -2(20) = -40^\circ$

④ $-75^\circ \cdot \frac{\pi}{180} = -\frac{5\pi}{12}$

⑤ $36^\circ \cdot \frac{\pi}{180} = \frac{\pi}{5}$

⑥ $250^\circ \cdot \frac{\pi}{180} = \frac{25\pi}{18}$

⑦ $\cot \theta > 0, \cos \theta > 0$
Q1, Q3 Q1, Q4

⑧ $\cos \theta < 0, \csc \theta < 0$
Q2, Q3 Q3, Q4

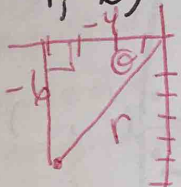
⑨ $\sec \theta > 0, \tan \theta < 0$
Q1, Q4 Q2, Q4

⑩ $\cot \theta < 0, \sin \theta > 0$
Q2, Q4 Q1, Q2

⑪ $\sin \theta > 0, \cos \theta < 0$
Q1, Q2 Q2, Q3

⑫ $\sin \theta < 0, \tan \theta > 0$
Q3, Q4 Q1, Q3

⑬ $(-4, -6)$



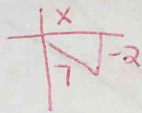
$r = 2\sqrt{13}$

$(-4)^2 + (-6)^2 = r^2$
 $16 + 36 = r^2$
 $52 = r^2$
 $\sqrt{52} = r$
 $2\sqrt{13}$

⑭

⑭ $\sin \theta = -\frac{2}{7}, \cos \theta > 0$
Q3, Q4 Q1, Q4

so it must be in Q4



$(-2)^2 + (x)^2 = (7)^2$

$x^2 = 45$
 $x = \sqrt{45}$
 $x = 3\sqrt{5}$

$\cos \theta = \frac{3\sqrt{5}}{7}$

$\tan \theta = \frac{-2}{3\sqrt{5}} \rightarrow \frac{-2\sqrt{5}}{15}$

$\sec \theta = \frac{7}{3\sqrt{5}} \rightarrow \frac{7\sqrt{5}}{15}$

$\sin \theta = \frac{-6}{2\sqrt{13}} \rightarrow \frac{-3 \cdot \sqrt{13}}{\sqrt{13} \cdot \sqrt{13}}$
rationalize

$\sin \theta = \frac{-3\sqrt{13}}{13}$

$\csc \theta = \frac{-\sqrt{13}}{3}$

$\cos \theta = \frac{-4}{2\sqrt{13}} \rightarrow \frac{-2 \cdot \sqrt{13}}{\sqrt{13} \cdot \sqrt{13}}$

$\cos \theta = \frac{-2\sqrt{13}}{13}$

$\sec \theta = \frac{-\sqrt{13}}{2}$

$\tan \theta = -\frac{6}{4} = \frac{3}{2}$

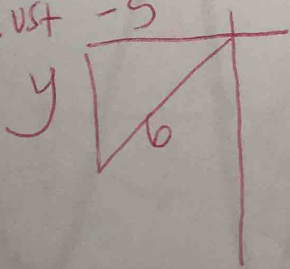
$\tan \theta = \frac{3}{2}$

$\cot \theta = \frac{2}{3}$

⑮ $\cos \theta = -\frac{5}{6}, \sin \theta < 0$
Q2, Q3 Q3, Q4

so it must be in y

⑯



$(-5)^2 + y^2 = (6)^2$
 $25 + y^2 = 36$

$y^2 = 11$

$y = \sqrt{11}$

$\rightarrow y = -\sqrt{11}$

$\sin \theta = \frac{-\sqrt{11}}{6}$

$\tan \theta = \frac{-\sqrt{11}}{-5}$ reduce

make it negative b/c Q3

$\tan \theta = \frac{\sqrt{11}}{5}$

$\frac{13\pi}{3}$ * find a coterminal angle on the unit circle

$$\frac{\pi}{3} - 2\pi$$

$$\frac{5\pi}{3} - \frac{6\pi}{3} = \frac{7\pi}{3}$$

$$\frac{7\pi}{3} - \frac{6\pi}{3} = \frac{\pi}{3}$$

$$\sin(\pi/3) = \sqrt{3}/2$$

still too big!

(17) $\cos -\frac{5\pi}{4}$

$$-\frac{5\pi}{4} + \frac{8\pi}{4} = \frac{3\pi}{4}$$

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

(18) $\tan -\frac{10\pi}{3}$

$$-\frac{10\pi}{3} + \frac{6\pi}{3} = -\frac{4\pi}{3}$$

$$-\frac{4\pi}{3} + \frac{6\pi}{3} = \frac{2\pi}{3}$$

$$\tan \frac{2\pi}{3} = -\sqrt{3}$$

(19) $\csc \frac{11\pi}{3}$

$$\frac{11\pi}{3} - \frac{6\pi}{3} = \frac{5\pi}{3}$$

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

(20) $\sec 7\pi$

$$7\pi - 2\pi = 5\pi$$

$$5\pi - 2\pi = 3\pi$$

$$3\pi - 2\pi = \pi$$

$$\sec \pi = -1$$

(21) $\cot -\frac{19\pi}{6}$

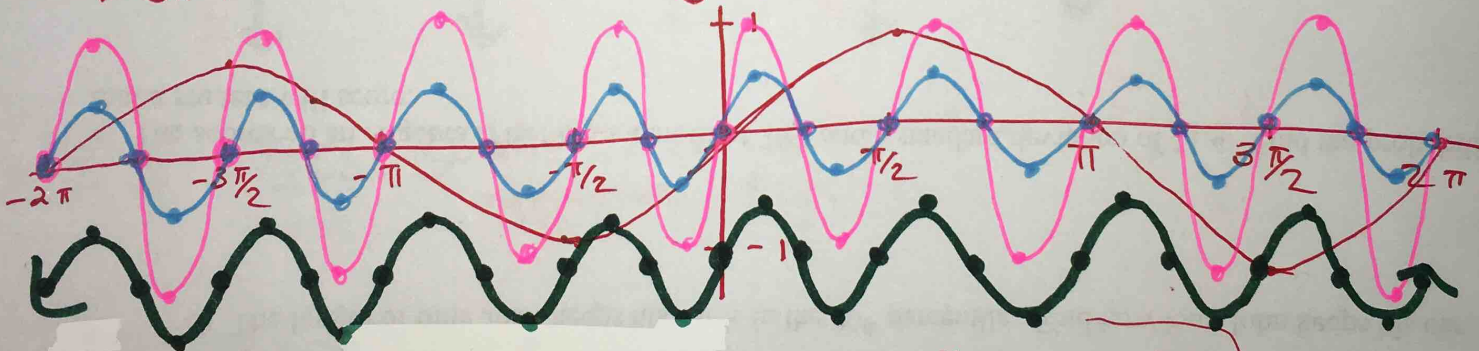
$$-\frac{19\pi}{6} + \frac{12\pi}{6} = -\frac{7\pi}{6}$$

$$-\frac{7\pi}{6} + \frac{12\pi}{6} = \frac{5\pi}{6}$$

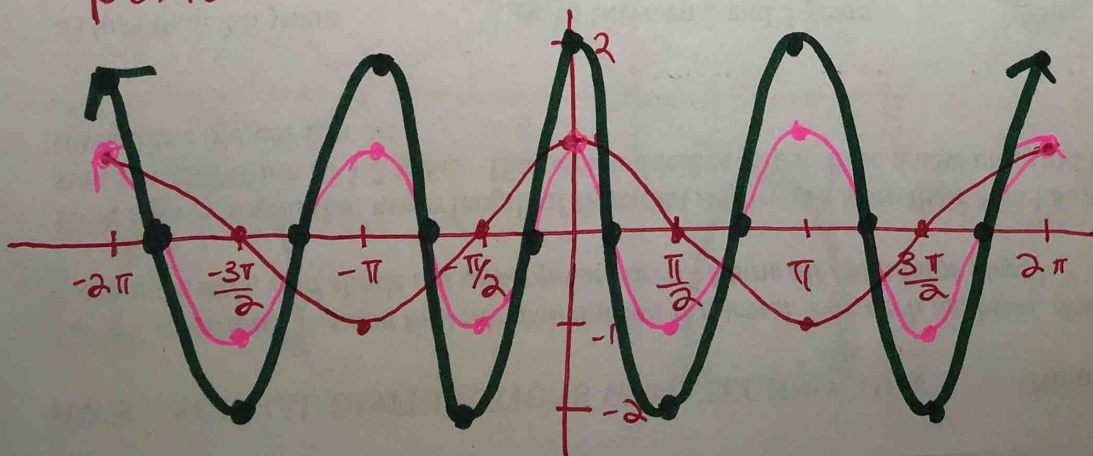
$$\cot \frac{5\pi}{6} = -\sqrt{3}$$

(22) $y = \frac{1}{2} \sin 4\theta - 1$

- amplitude = $\frac{1}{2}$ so $\frac{1}{2}$ as tall as original
- period = $\frac{2\pi}{4} = \frac{\pi}{2}$ so it repeats 4 times faster than original function
- v. shift = 1 so entire graph shifts down 1 unit



(23) $y = 2 \cos 2\theta$ • amp = 2 so twice as tall as original
 • period = $\frac{2\pi}{2} = \pi$ so it repeats 2 times faster than original



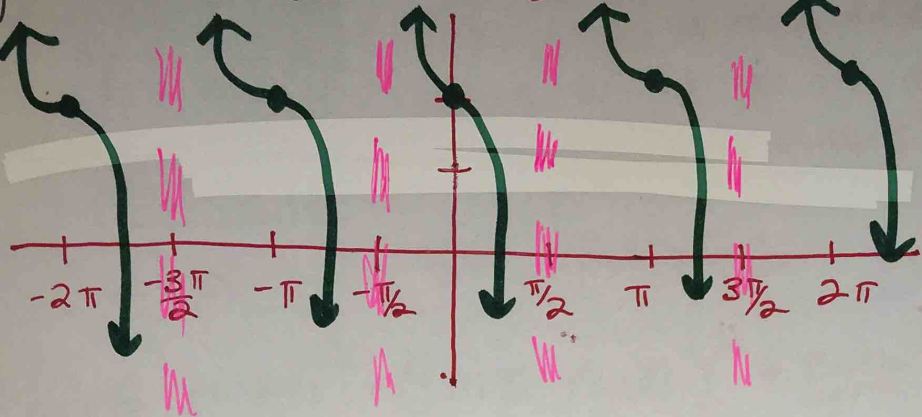
- $\sin \theta$
- $\sin 4\theta$
- $\frac{1}{2} \sin 4\theta$
- $\frac{1}{2} \sin 4\theta - 1$

- $\cos \theta$
- $\cos 2\theta$
- $2 \cos 2\theta$

$y = -\tan \theta + 2$

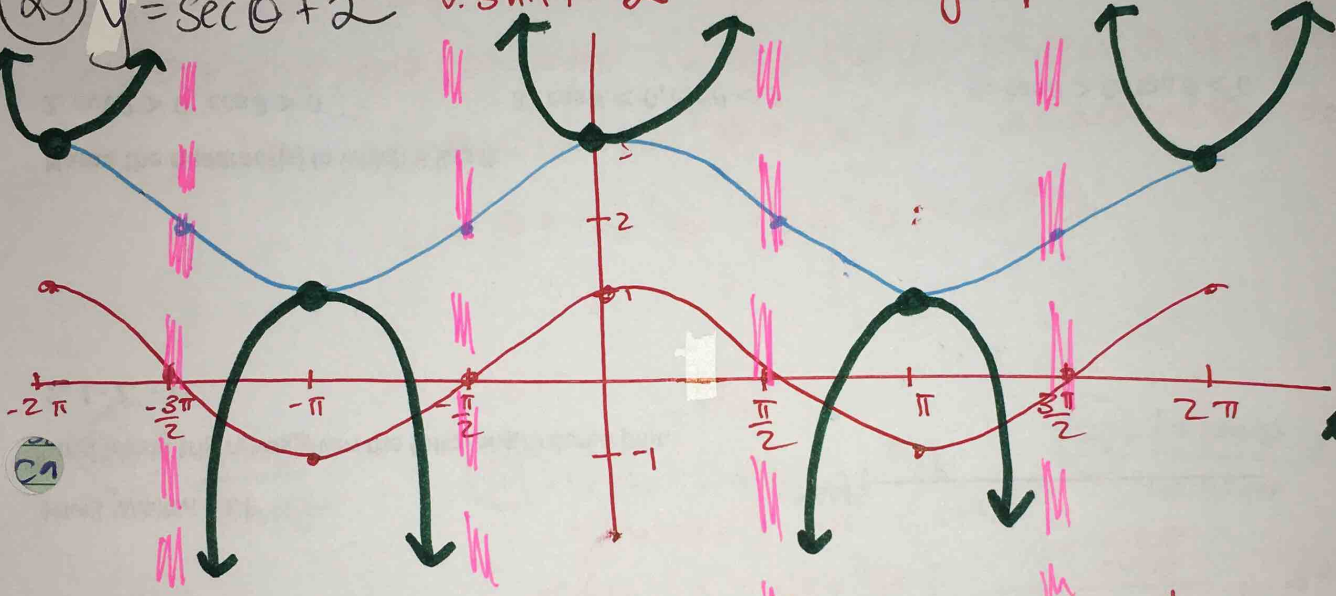
negative \rightarrow flips

+2 \rightarrow v shift up 2



(25) $y = \sec \theta + 2$

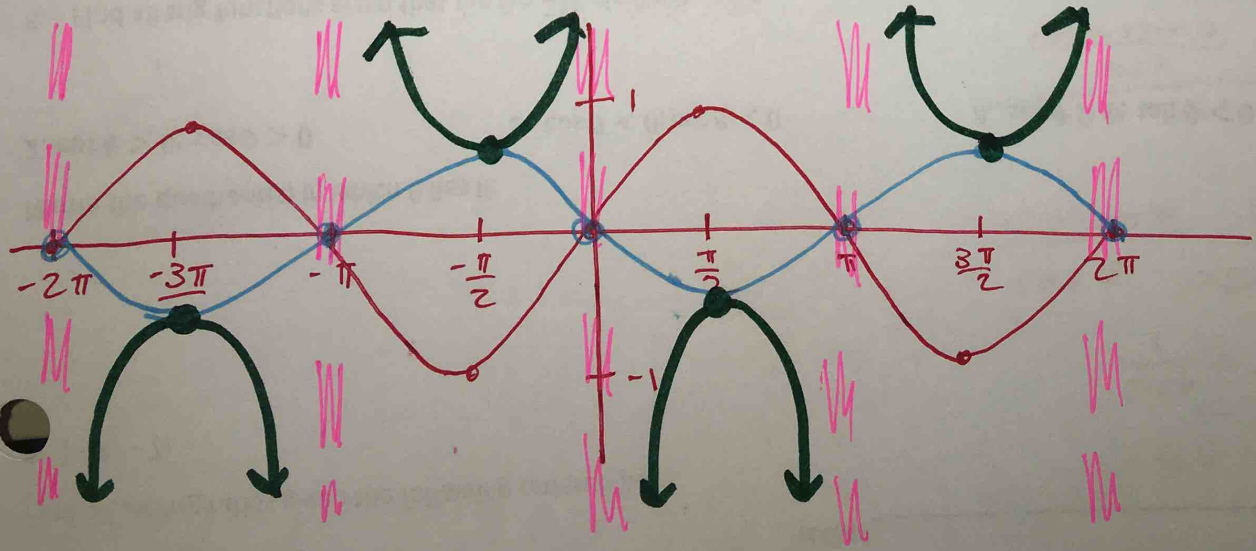
v. shift = 2 so entire graph shifts up 2 units



$\cos \theta$
 $\cos \theta + 2$
 $\sec \theta + 2$

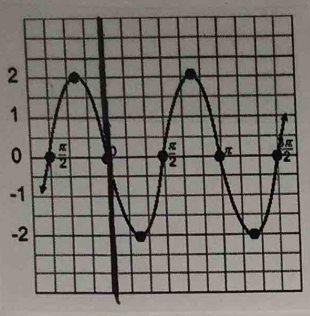
(26) $y = -\frac{1}{2} \csc \theta$

amp = 1/2 so 1/2 as tall as original
 negative flips it



$\sin \theta$
 $-\frac{1}{2} \sin \theta$
 $-\frac{1}{2} \csc \theta$

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- height goes up to 2 & down to -2 → amp = 2
- at x=0 its in the middle → sin θ
- repeats at π so its going 2 times faster
- flipped over x-axis

$$y = -2 \sin 2\theta$$

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$$(\sin \theta + \cos \theta)^2 + (\sin \theta - \cos \theta)^2 \quad \text{★ FOIL!}$$

$$\begin{aligned} & (\sin \theta + \cos \theta)(\sin \theta + \cos \theta) + (\sin \theta - \cos \theta)(\sin \theta - \cos \theta) \\ & \sin^2 \theta + \sin \theta \cos \theta + \sin \theta \cos \theta + \cos^2 \theta + \sin^2 \theta - \sin \theta \cos \theta - \sin \theta \cos \theta + \cos^2 \theta \\ & \sin^2 \theta + 2 \sin \theta \cos \theta + \cos^2 \theta + \sin^2 \theta - 2 \sin \theta \cos \theta + \cos^2 \theta \\ & \sin^2 \theta + \cos^2 \theta + \sin^2 \theta + \cos^2 \theta \\ & \quad \quad \quad | \quad + \quad | \end{aligned}$$

2

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$$\frac{\sec \theta}{\tan \theta}$$

$$\frac{\frac{1}{\cos \theta}}{\frac{\sin \theta}{\cos \theta}}$$

$$\frac{1}{\cancel{\cos \theta}} \cdot \frac{\cancel{\cos \theta}}{\sin \theta}$$

$$\frac{1}{\sin \theta}$$

$$\csc \theta$$

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$$\sin \theta + \sin \theta \cot^2 \theta$$

★ Factor out GCF ★

$$\sin \theta (1 + \cot^2 \theta)$$

$$\sin \theta \csc^2 \theta$$

$$\frac{1}{\csc \theta} \cdot \frac{\csc^2 \theta}{1}$$

$$\csc \theta$$

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$$\frac{1 + \tan \theta}{\sin \theta + \cos \theta} = \sec \theta$$

$$\frac{1 + \frac{\sin \theta}{\cos \theta}}{\sin \theta + \cos \theta} = \sec \theta$$

$$\frac{\frac{\cos \theta + \sin \theta}{\cos \theta}}{\sin \theta + \cos \theta} = \sec \theta$$

$$\frac{\frac{\cos \theta + \sin \theta}{\cos \theta}}{\cos \theta + \sin \theta} = \sec \theta$$

$$\frac{\cos \theta + \sin \theta}{\cos \theta} \cdot \frac{1}{\cancel{\cos \theta + \sin \theta}} = \sec \theta$$

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

$$\sec \theta = \sec \theta \quad \text{!!}$$

$$\frac{\cos \theta}{\sec \theta} + \frac{\sin \theta}{\csc \theta} = 1$$

$$\cos \theta \cdot \frac{1}{\sec \theta} + \sin \theta \cdot \frac{1}{\csc \theta} = 1$$

$$\cos \theta \cdot \cos \theta + \sin \theta \cdot \sin \theta = 1$$

$$\cos^2 \theta + \sin^2 \theta = 1$$

$$1 = 1 \quad \text{☺}$$

$$\textcircled{34} \quad \cos \theta = \sin \theta \cot \theta$$

$$\cos \theta = \cancel{\sin \theta} \cdot \frac{\cos \theta}{\cancel{\sin \theta}}$$

$$\cos \theta = \cos \theta \quad \text{☺}$$

$$\textcircled{3b} \quad \sqrt{2} \sin \theta = 1$$

$$\sin \theta = \frac{1}{\sqrt{2}}$$

$$\sin \theta = \frac{\sqrt{2}}{2} \quad \text{Q1, 2}$$

$$\theta = \frac{\pi}{4}, \frac{3\pi}{4}$$

$$\textcircled{33} \quad \sin \theta + \tan \theta \cos \theta + \cos^2 \theta = 1$$

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

$$\sin^2 \theta + \cos^2 \theta = 1$$

$$1 = 1 \quad \text{☺}$$

$$\textcircled{35} \quad 2 + 4 \cos \theta = 0$$

$$4 \cos \theta = -2$$

$$\cos \theta = -1/2 \quad \text{Q2, 3}$$

$$\theta = \frac{2\pi}{3}, \frac{4\pi}{3}$$