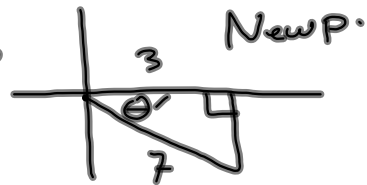
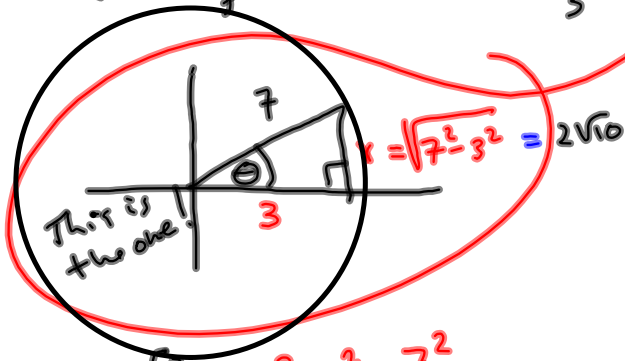


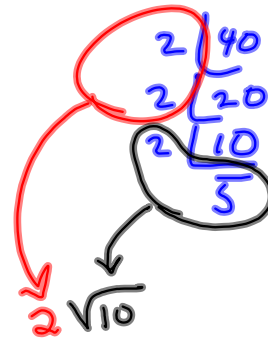
$\sec \theta = \frac{7}{3}$ and $0 \leq \theta \leq \pi$

2 triangles w/ $\sec \theta = \frac{7}{3}$



$\sin \theta = \frac{2\sqrt{10}}{7}$
 $\cos \theta = \frac{3}{7}$
 $\tan \theta = \frac{2\sqrt{10}}{3}$

$3^2 + x^2 = 7^2$
 $x^2 = 49 - 9$
 $\sqrt{x^2} = \sqrt{40}$
 $|x| = \sqrt{40}$
 $x = \sqrt{40}$ or $x = -\sqrt{40}$



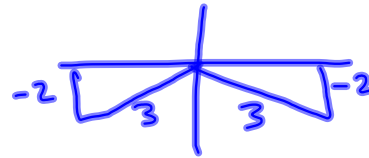
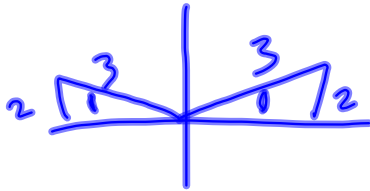
③ $\cos \theta = \frac{2}{3}$ and $\pi < \theta < 2\pi$

$\sqrt{3^2 - 2^2} = \sqrt{5}$

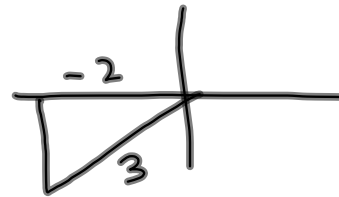
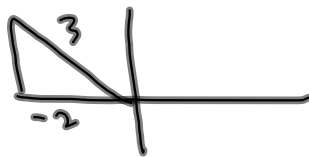
Use proper grammar & syntax.

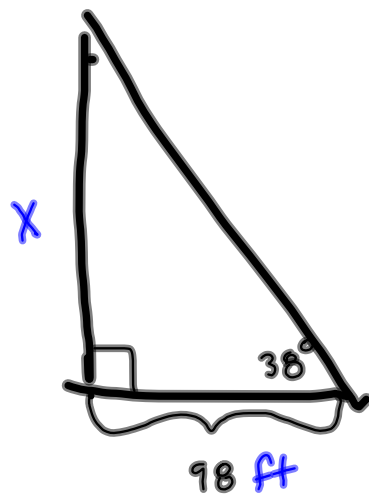
$\sin \theta = \frac{2}{3}$

$\sin \theta = -\frac{2}{3}$



$\cos \theta = -\frac{2}{3}$



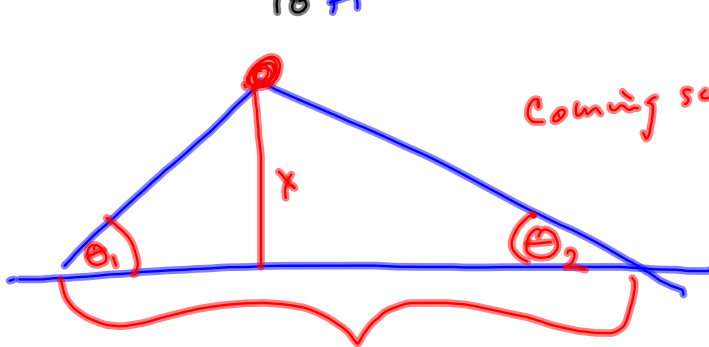


$$\frac{x}{98} = \tan 38^\circ$$

$$x = 98 \tan 38^\circ$$

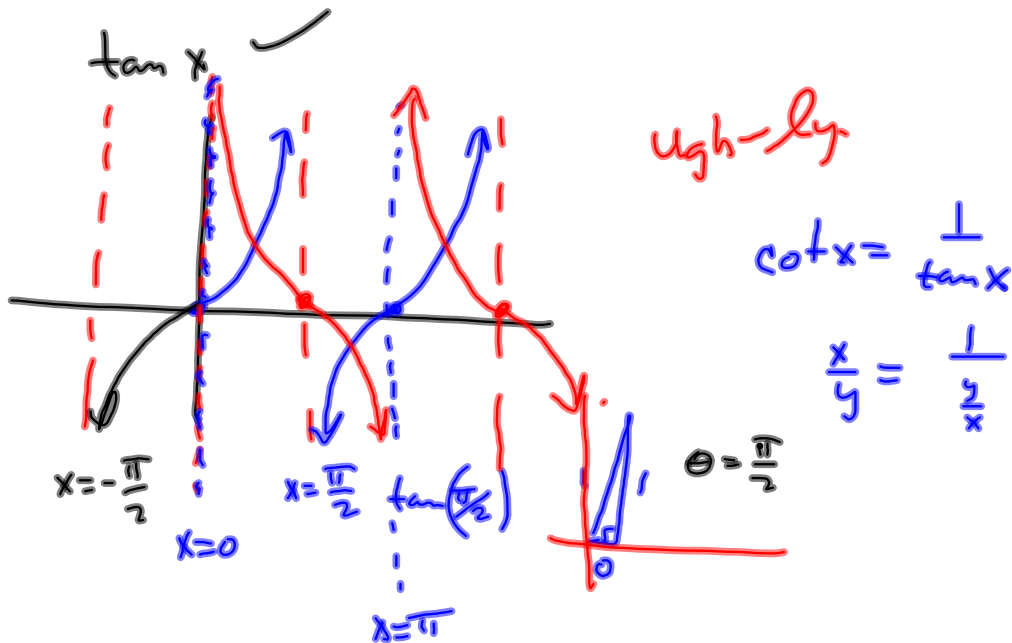
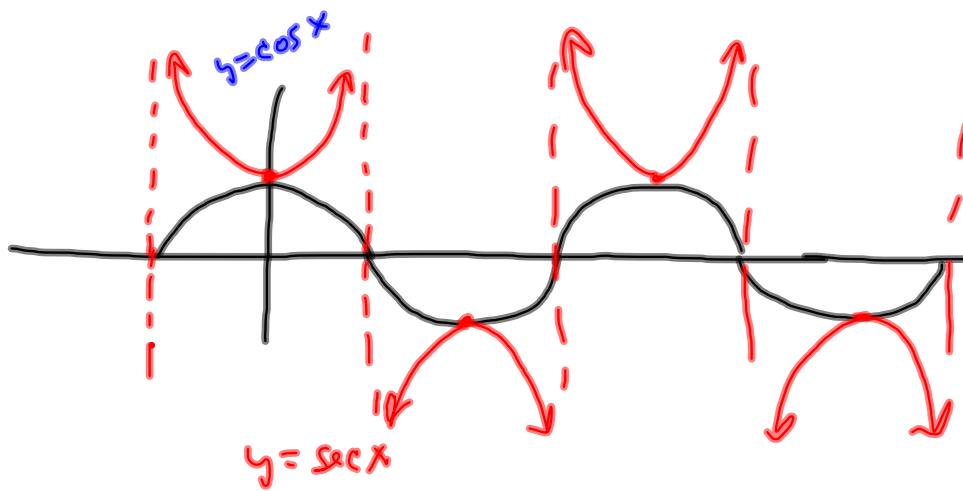
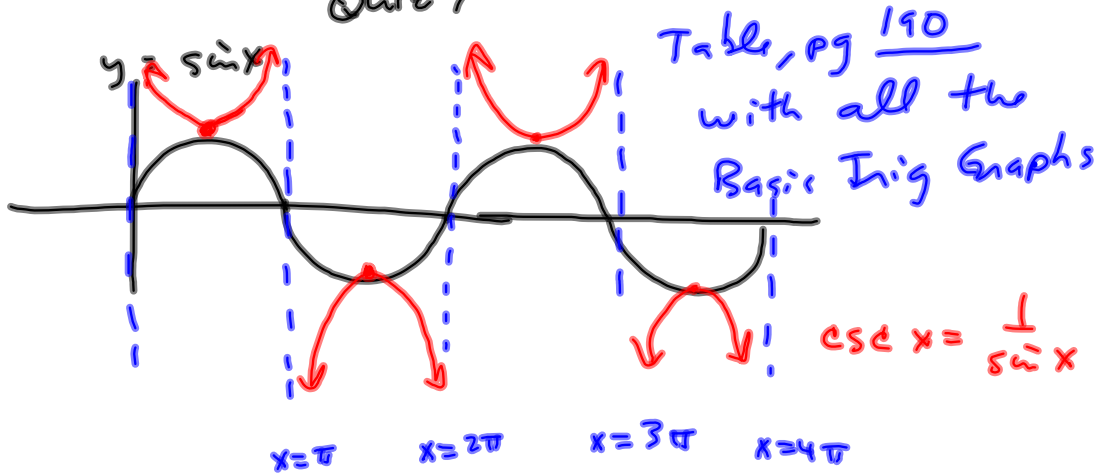
$$\approx 76.566 \text{ ft}$$

Triangulating



Coming soon!

For the rest of Quiz, see website



$$g(x) = 17 \tan\left(\frac{\pi}{3}x - \pi\right) + 57$$

$$= 17 \tan\left(\frac{\pi}{3}(x-3)\right) + 57$$

$$\frac{\pi}{\frac{\pi}{3}} =$$

$$\pi \cdot \frac{3}{\pi} = 3$$

Counter-intuitive

$$f(x) = \tan x$$

$$f\left(\frac{\pi}{3}x\right) = \tan\left(\frac{\pi}{3}x\right) \quad (x, y) \rightarrow \left(\frac{x}{\frac{\pi}{3}}, y\right)$$

$$f(2x) : (x, y) \rightarrow \left(\frac{x}{2}, y\right)$$

$$f\left(\frac{\pi}{3}(x-3)\right) = \tan\left(\frac{\pi}{3}(x-3)\right)$$

$$(x, y) \rightarrow (x+3, y)$$

Delay by 3

Takes $x+3$ to get where x used to get us.

$$17f\left(\frac{\pi}{3}(x-3)\right) = 17 \tan\left(\frac{\pi}{3}(x-3)\right)$$

$$(x, y) \rightarrow (x, 17y)$$

$$17f\left(\frac{\pi}{3}(x-3)\right) + 57 = 17 \tan\left(\frac{\pi}{3}(x-3)\right) + 57$$

$$(x, y) \rightarrow (x, y+57)$$

$$f\left(\frac{\pi}{3}x\right) = \tan\left(\frac{\pi}{3}x\right)$$

$$f\left(\frac{\pi}{3}(x-3)\right) = \tan\left(\frac{\pi}{3}(x-3)\right)$$

$$17f\left(\frac{\pi}{3}(x-3)\right) = 17 \tan\left(\frac{\pi}{3}(x-3)\right)$$

$$17\left(f\left(\frac{\pi}{3}(x-3)\right) + 57\right) = 17 \tan\left(\frac{\pi}{3}(x-3)\right) + 57$$

I wish I'd done it this way:

$$\begin{aligned} &\tan\left(\frac{\pi}{3}x\right) && \text{Main trig} \\ &17 \tan\left(\frac{\pi}{3}x\right) && \text{Stretch} \\ &17 \tan\left(\frac{\pi}{3}(x-3)\right) && \text{before} \\ &17 \tan\left(\frac{\pi}{3}(x-3)\right) + 57 && \text{Shift} \end{aligned}$$

A good order for Building these is

- $f(ax)$ → stretches first!
- $b f(ax)$
- $b f(a(x+c))$
- $b f(a(x+c)) + d$

See #3 on homework

You're given some data to build a cosine function. Getting its period and amplitude 1st is the wise choice

$$\text{High} = 25$$

$$\text{Low} = -10$$

$$\text{Amplitude} = \frac{25 - (-10)}{2}$$

$$\frac{35}{2} \cos(\theta) = \frac{35}{2}$$

Period 24 hrs

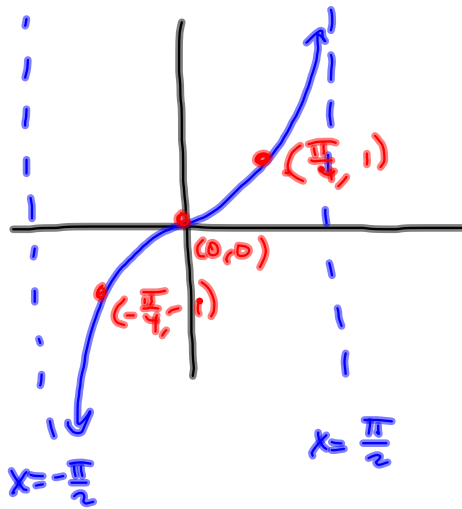
$$\frac{2\pi}{b} = 24$$

$$\frac{35}{2} \cos\left(\frac{\pi}{12}\theta\right)$$

$$\frac{\pi}{12} = \frac{2\pi}{24} = b$$

$$g(x) = 21 \tan\left(\frac{\pi}{6}x - \frac{\pi}{3}\right) - 11 = 21 \tan\left(\frac{\pi}{6}(x-2)\right) - 11$$

$$f(x) = \tan(x)$$



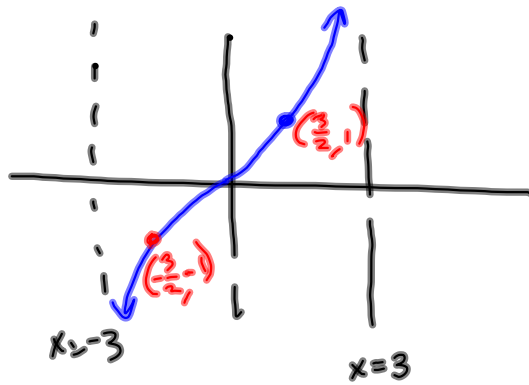
OK $\frac{\frac{\pi}{3}}{\frac{\pi}{6}} = \frac{\pi}{3} \cdot \frac{6}{\pi} = 2 \checkmark$

- x-stretch
- x-shift
- y-stretch
- y-shift

OK

- x-stretch
- y-stretch
- x-shift
- y-shift

$$\tan(x) \rightarrow \tan\left(\frac{\pi}{6}x\right)$$



Period!

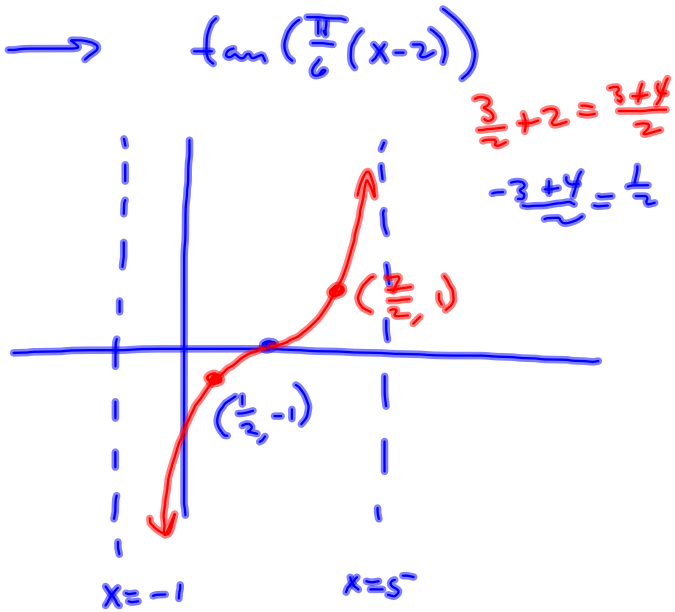
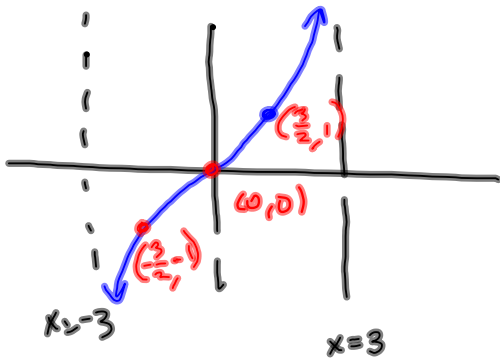
$$\frac{\pi}{\frac{\pi}{6}} = 6$$

Divide x-values by $\frac{\pi}{6}$ for $\tan\left(\frac{\pi}{6}\right)$

$$\frac{\pi}{4} \cdot \frac{6}{\pi} = \frac{3}{2}$$

$$\frac{\pi}{2} \cdot \frac{6}{\pi} = 3$$

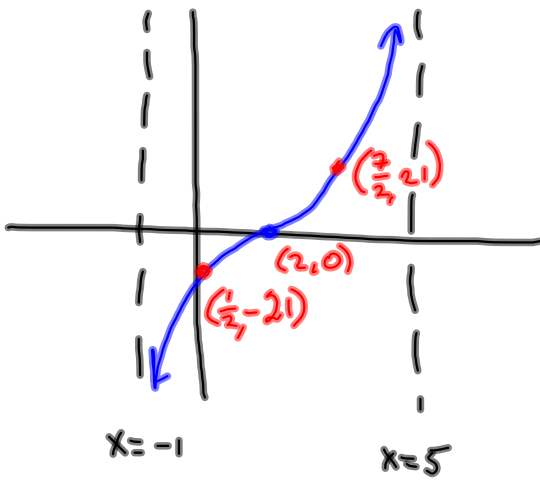
$$\tan(x) \rightarrow \tan\left(\frac{\pi}{6}x\right) \rightarrow \tan\left(\frac{\pi}{6}(x-2)\right)$$



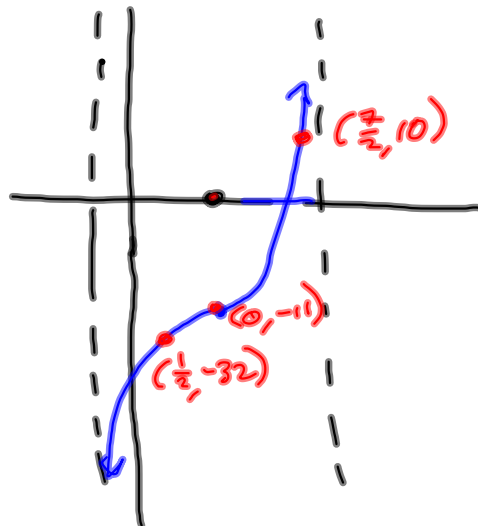
$$\frac{3}{2} + 2 = \frac{3+4}{2}$$

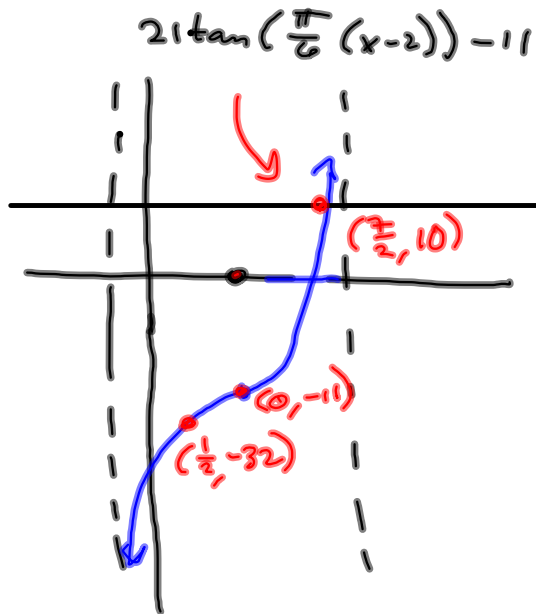
$$\frac{-3+4}{2} = \frac{1}{2}$$

$$21 \tan\left(\frac{\pi}{6}(x-2)\right)$$



$$21 \tan\left(\frac{\pi}{6}(x-2)\right) - 11$$





Graph the line

$$y = 10$$

and show where it
meets the graph of
 $g(x)$

$$21 \tan\left(\frac{\pi}{6}(x-2)\right) - 11 = 10$$

$$21 \tan\left(\frac{\pi}{6}(x-2)\right) = 21$$

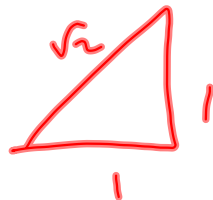
$$\tan\left(\frac{\pi}{6}(x-2)\right) = 1$$

$$\frac{\pi}{6}(x-2) = \arctan(1)$$

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

$$x-2 = \frac{3}{2}$$

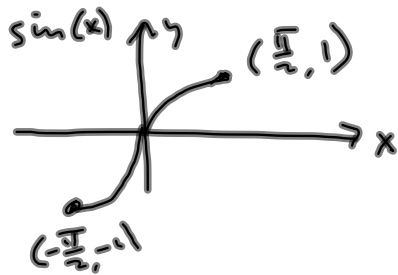
$$x = 2 + \frac{3}{2} = \frac{4}{2} + \frac{3}{2} = \frac{7}{2}$$



$$\arcsin\left(\sin\left(\frac{\pi}{6}\right)\right) = \frac{\pi}{6}$$

$$\arcsin\left(\sin\left(\frac{13\pi}{6}\right)\right) = \frac{\pi}{6}, \text{ also}$$

arcsine reports angles between $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$



$$\arccosine: [0, \pi]$$

$$\arctangent: \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$



$$\cot(\arctan x) = \frac{1}{x}$$

$$\sin(\arctan x) = \frac{x}{\sqrt{x^2+1}}$$

§ 2.1 Using Identities

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

① Reciprocal Identities (6)

② Quotient Identities (2)

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{\frac{y}{r}}{\frac{x}{r}} = \frac{y}{x}$$

③ Pythagoreans: $\sin^2 \theta + \cos^2 \theta = 1$

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

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

$$\frac{\cos^2 x}{\sin^2 x} + \frac{\sin^2 x}{\sin^2 x}$$

$$= \frac{\cos^2 x + \sin^2 x}{\sin^2 x}$$

$$= \frac{1}{\sin^2 x}$$

$$= \csc^2 x$$

④ Cofunction Identities

Bleah.

$$\tan\left(\frac{\pi}{2} - \theta\right) = \cot \theta$$

$$\tan\left(-\left(\theta - \frac{\pi}{2}\right)\right)$$

$$\tan(-\theta) \rightarrow \tan\left(-\left(\theta - \frac{\pi}{2}\right)\right)$$

⑤ Even/Odd

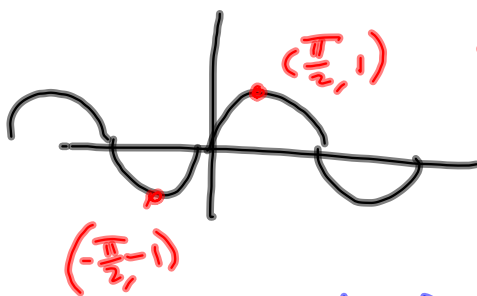
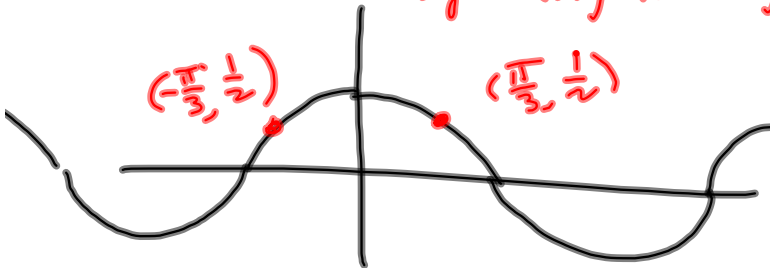
Even: $f(-x) = f(x)$

odd: $f(-x) = -f(x)$

$\cos(x)$ is even!

$$\cos\left(-\frac{\pi}{3}\right) = \cos\left(\frac{\pi}{3}\right)$$

Symmetry about y-axis.



$$\sin\left(-\frac{\pi}{6}\right) = -\sin\left(\frac{\pi}{6}\right)$$

EVEN + EVEN = EVEN

EVEN + ODD = ODD

$$(E)(O) = O$$

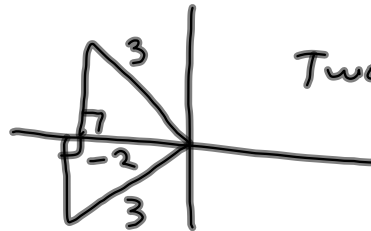
$$(O)(O) = E$$

$$\frac{(O)(O)}{(E)(O)} = O$$

§ 2.1 #5 1-6, 9-17, 20-24,
 37-50, 53-83, 93-108, 117, 123-138
 calc II

Example 1 Just draw the triangle!

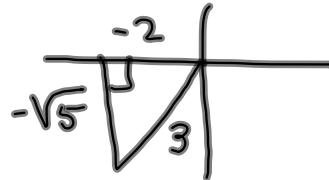
$$\sec u = -\frac{3}{2}$$



Two poss.

AND if $\tan u > 0 \Rightarrow$

$$3^2 - 2^2 = 9 - 4 = 5$$



#5 11-24

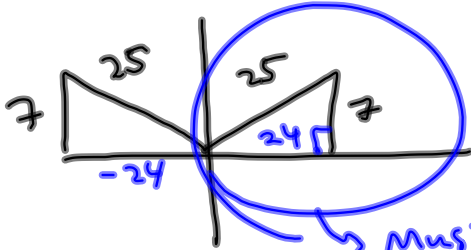
$$\csc \theta = \frac{25}{7}$$

$$\tan \theta = \frac{7}{24}$$

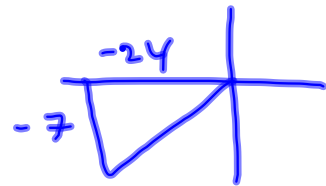
$$25^2 - 7^2 = 625 - 49$$

$$= 576$$

$$\sqrt{576} = 24$$



must be this guy



"Simplifying" trig expressions can be ambiguous. It's tough in 122 to motivate some of these skills.

$$\int \sin^3 x \, dx \text{ is HARD}$$

$$\begin{aligned} \sin^3(x) &= (\sin(x))(\sin^2(x)) \\ &= \sin(x)(1 - \cos^2 x) \\ &= \sin x - \sin x \cos^2 x \end{aligned}$$

$$\int \sin x \, dx - \int \sin x \cos^2 x \, dx \text{ is EASY.}$$