Math 1060 - Day 17 (2nd half)

Fall 2013

4.6 - Other Trig Functions

Define

$$\tan(x) = \frac{\sin(x)}{\cos(x)}$$

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

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

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

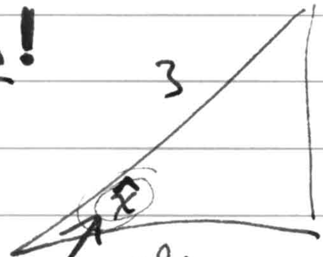
Math 1060 – Day 17 ([redacted])

fall 2013

4.6 – Other Trig Functions

$\boxed{\text{Suppose } \sin(x) = \frac{-2}{3} \text{ And that } \frac{3\pi}{2} < t < 2\pi}$ $\boxed{\text{Find all 6 trig } \measuredangle\text{'s}}$

Draw a Δ!



$adj^2 + 2^2 = 3^2$

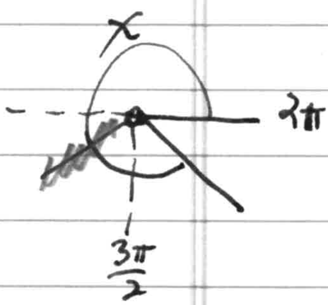
$adj^2 = 9 - 4 = 5$

$adj = \sqrt{5}$

Reference $\measuredangle$ for x

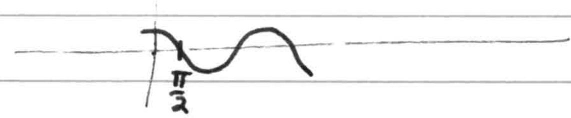
10

Evaluate Ref $\measuredangle$	Compute value at t
$\sin\hat{x} = \frac{opp}{hyp} = \frac{2}{3}$	y-coord is negative $\Rightarrow \sin(x) = -\frac{2}{3}$
$\cos\hat{x} = \frac{adj}{hyp} = \frac{\sqrt{5}}{3}$	x-coord is pos $\Rightarrow \cos(x) = \frac{\sqrt{5}}{3}$
$\tan\hat{x} = \frac{opp}{adj} = \frac{2}{\sqrt{5}}$	$\frac{neg}{pos} = neg \Rightarrow \tan(x) = \frac{-2}{\sqrt{5}}$
$\csc(\hat{x}) = \frac{1}{\sin\hat{x}} = \frac{3}{2}$	$\frac{1}{neg} = neg \Rightarrow \csc(x) = \frac{-3}{2}$
$\sec(\hat{x}) = \frac{1}{\cos\hat{x}} = \frac{3}{\sqrt{5}}$	$\frac{1}{pos} = pos \Rightarrow \sec(x) = \frac{3}{5}$
$\cot(\hat{x}) = \frac{1}{\tan\hat{x}} = \frac{\sqrt{5}}{2}$	$\frac{1}{neg} = neg \Rightarrow \cot(x) = \frac{-\sqrt{5}}{2}$



$$y = \tan(x) = \frac{\sin(x)}{\cos(x)}$$

is undefined whenever ~~x~~ $\cos(x) = 0$

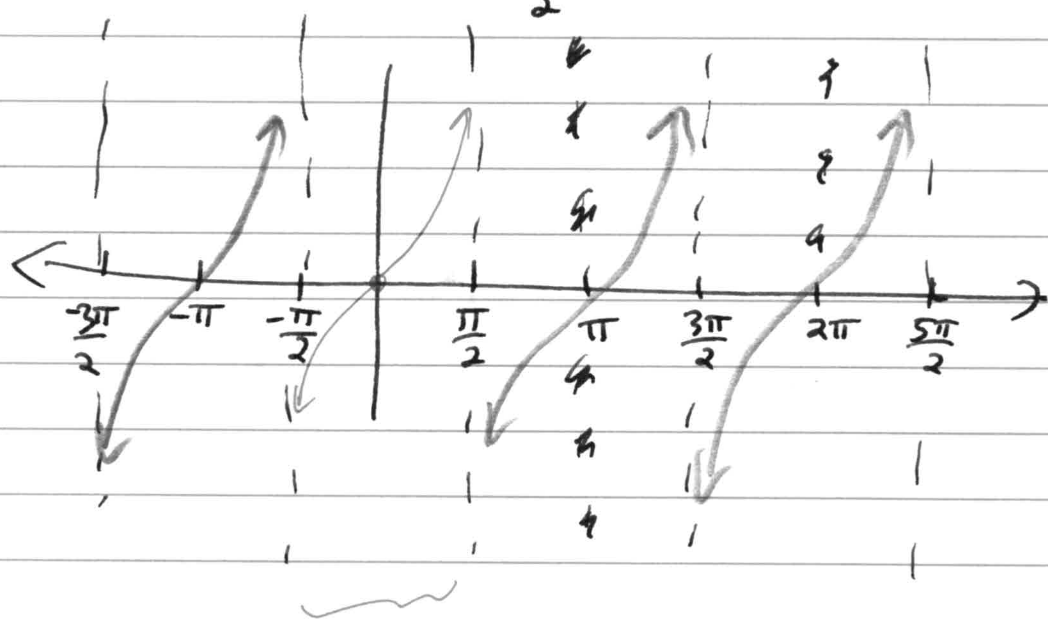


so $\tan(x)$ is undefined at $x = \frac{\pi}{2} + n \cdot \pi$

where n is any

10 integer

this gives us vertical
asymptote at each
$\frac{\pi}{2} + n\pi$



Draw then explain $\frac{\sin(x)}{\cos(x)}$ $\begin{array}{l} \to 1 \\ \to 0 \text{ as pos \#} \end{array}$ $\Rightarrow \tan$

$\frac{\sin(x)}{\cos(x)}$ $\begin{array}{l} \to -1 \\ \to 0 \text{ as pos \#} \end{array}$ $\Rightarrow \tan(x) \to -$

then say this repeats everywhere.

Notice: $\tan(x)$ has period π.

Graph $f(x)=\tan(2x)$

$f(x)=\tan(2x)$ has period ~~is~~ $\frac{\pi}{2}$

check

~~tan~~

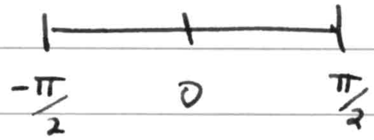
$f(\boxed{x+\frac{\pi}{2}}) = \tan(2(\boxed{x+\frac{\pi}{2}}))$

$= \tan(2x+\pi)$

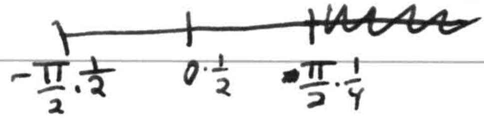
$= \tan(2x)$

$f(x+\frac{\pi}{2}) = f(x)$

idea



is shrunk to



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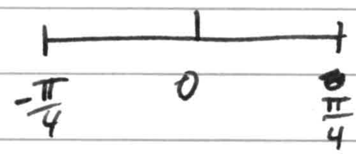
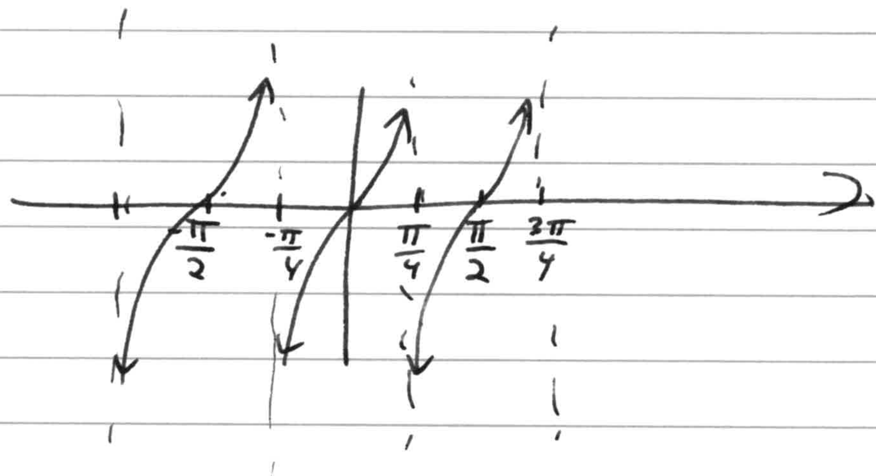


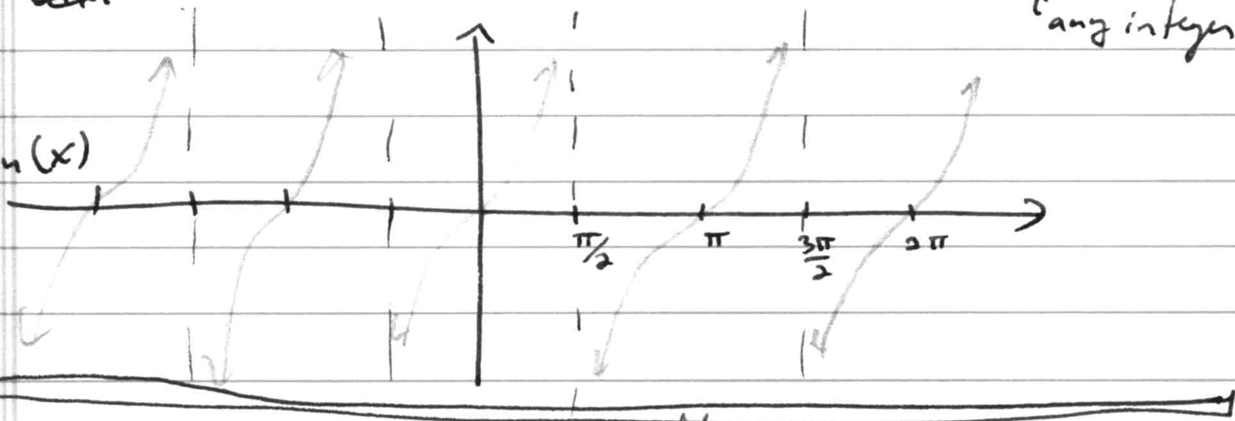


to graph $f(x) = \cot(x) = \frac{1}{\tan(x)}$

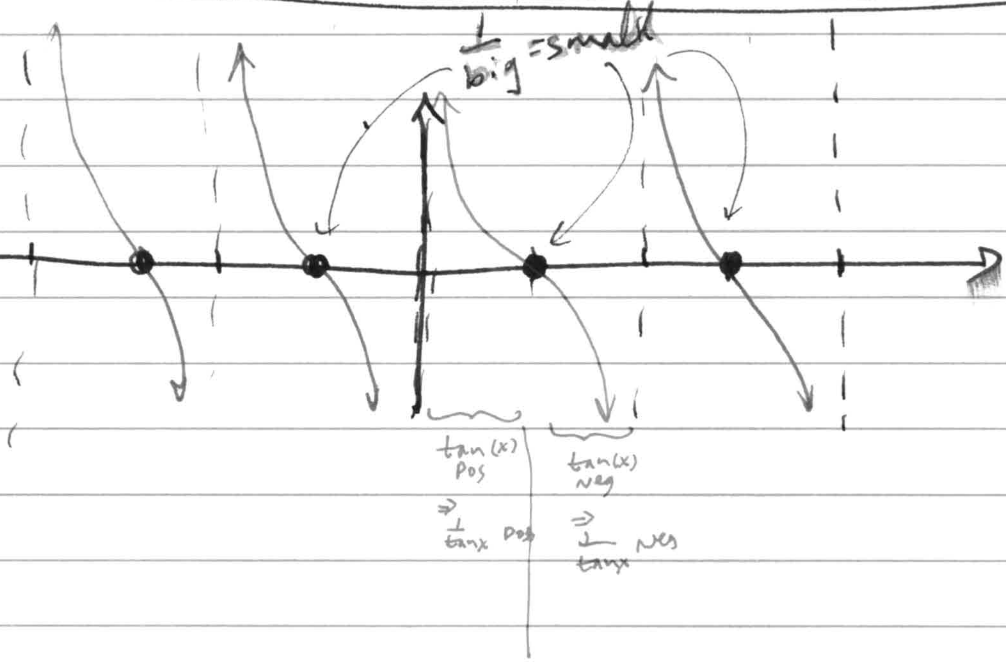
NOTE $f(x)$ undef'd $\Leftrightarrow \tan(x) = 0 \Leftrightarrow x = n \cdot \pi$

n = any integer

$y = \tan(x)$



$y = \cot(x)$



this pattern repeats with period π

$\cot(2x)$ has period $\frac{\pi}{2}$

$\cot(Bx)$ has period $\frac{\pi}{B}$

be able to modify graphs of tan & cot as with sin & cos.

don't worry about sec & csc

The graphs of csc & sec are the weirdest.

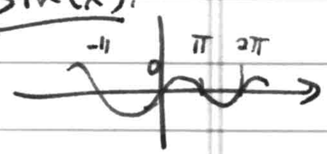
$$f(x) = \csc(x) = \frac{1}{\sin(x)}$$

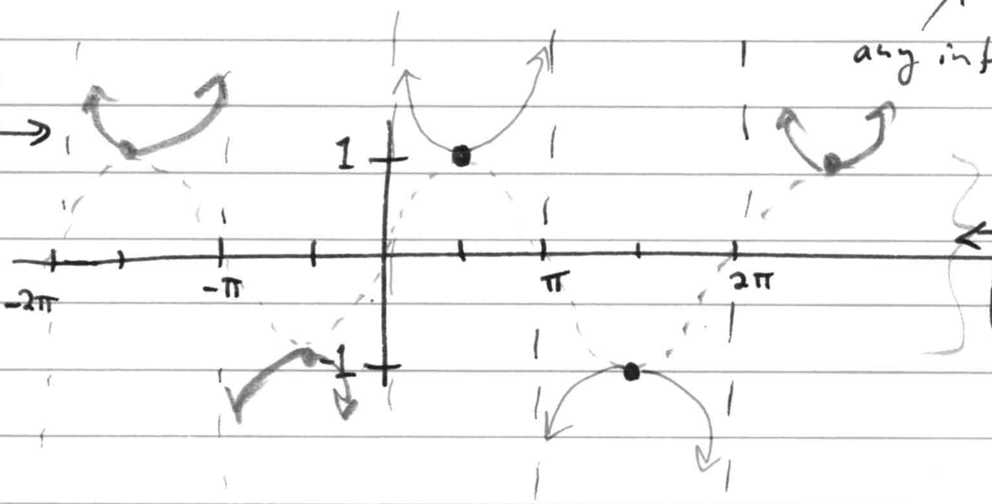
is undef'd $\iff \sin(x) = 0$

$\iff x = n\pi$

any integer

sin(x):





Draw dotted sin(x) first

$$f\left(\frac{\pi}{2}\right) = \csc\left(\frac{\pi}{2}\right) = \frac{1}{\sin\left(\frac{\pi}{2}\right)} = 1$$

as $x \to \pi$, $\sin(x) \to 0^+$

so $\frac{1}{\sin(x)} \to \infty^+$

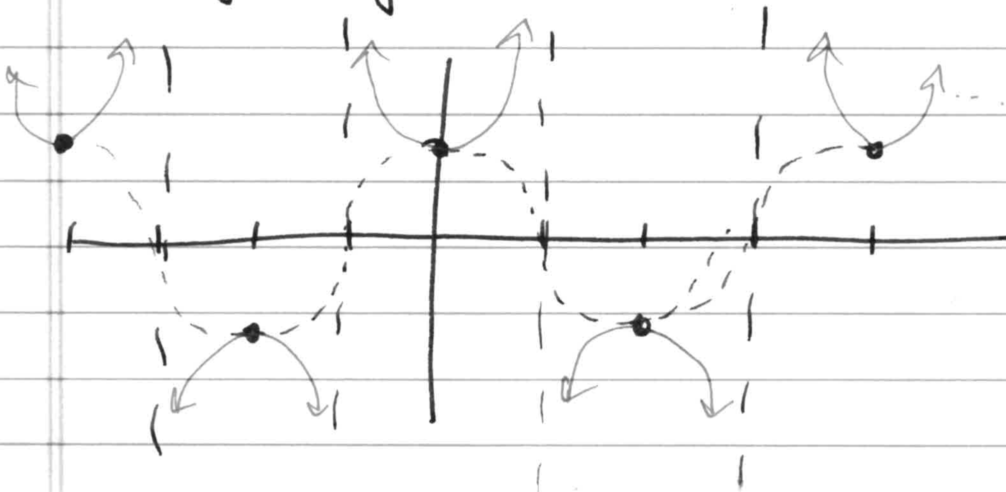
$$f\left(\frac{3\pi}{2}\right) = \csc\left(\frac{3\pi}{2}\right) = \frac{1}{\sin\left(\frac{3\pi}{2}\right)} = \frac{1}{-1} = -1$$

as $x \to 2\pi$, $\sin(x) \to 0^-$

so $\frac{1}{\sin(x)} \to -\infty$

& fill in rest (solid pencil)

to get $y = \sec(x) = \frac{1}{\cos(x)}$



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to get cot, do same thing to $\tan(x)$.

(see book).