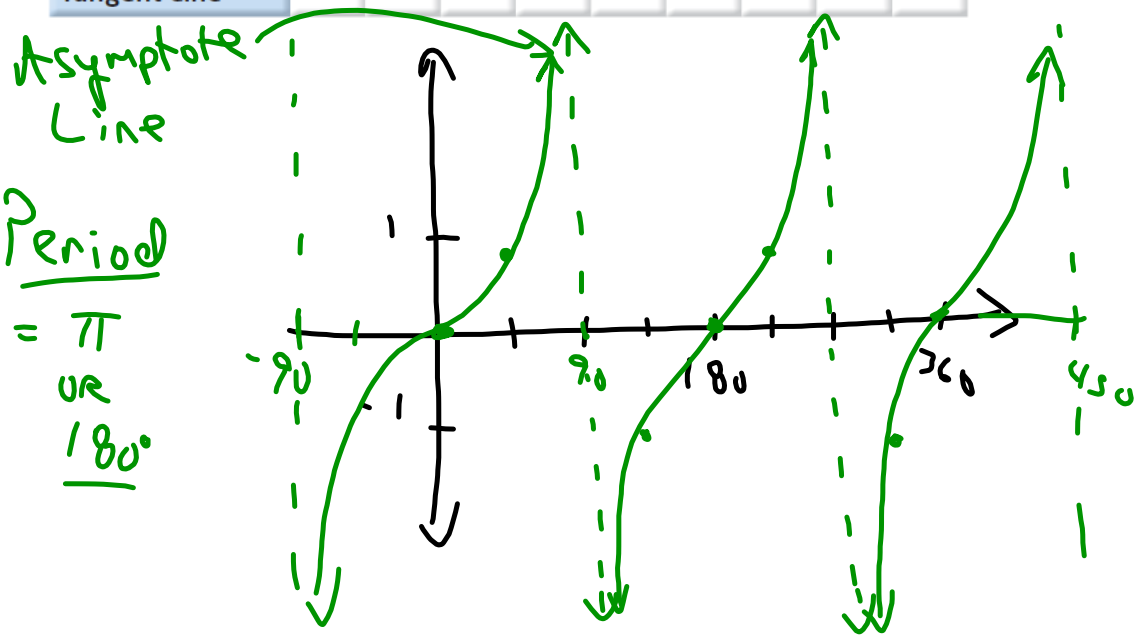
Graph the Tangent Function

Graph the function $y = \tan\theta$ for $-2\pi \leq \theta \leq 2\pi$. Describe its characteristics.

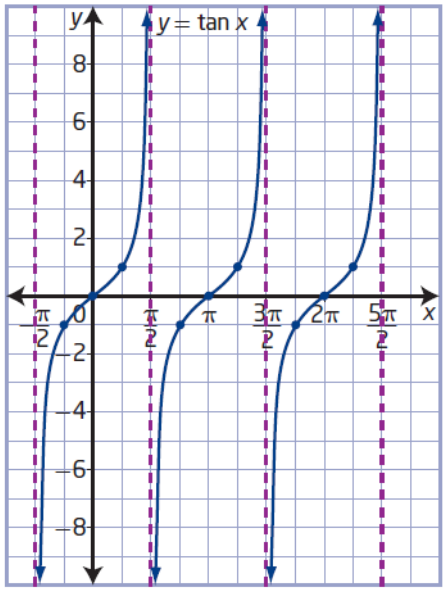
Angle Measure	0°	45°	90°	135°	180°	225°	270°	315°	360°
y-coordinate on Tangent Line	0	1	und	-1	0	1	und	-1	0



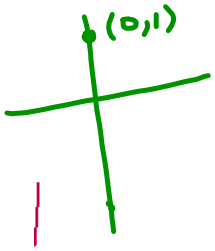
Key Ideas

- You can use asymptotes and three points to sketch one cycle of a tangent function. To graph $y = \tan x$, draw one asymptote; draw the points where $y = -1$, $y = 0$, and $y = 1$; and then draw another asymptote.

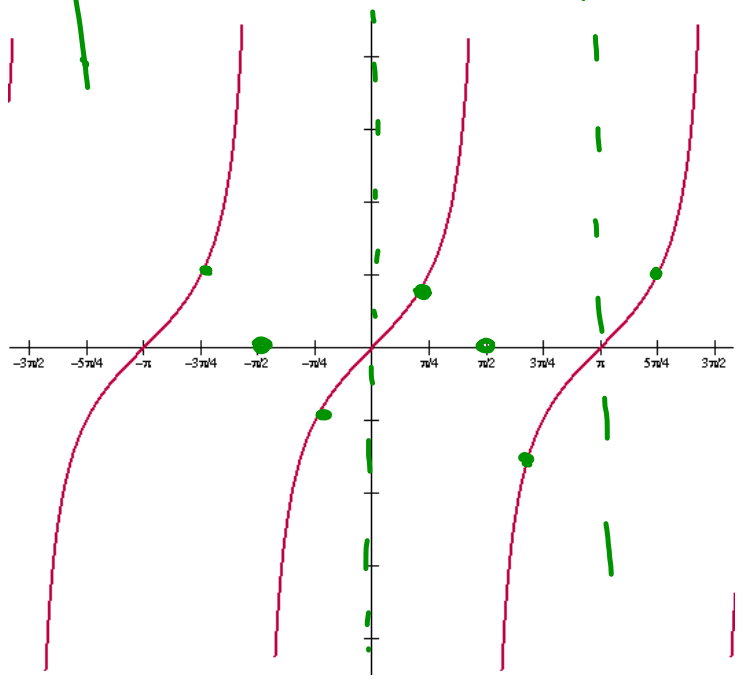
How can you determine the location of the asymptotes for the function $y = \tan x$?



- The tangent function $y = \tan x$ has the following characteristics:
  - The period is π.
  - The graph has no maximum or minimum values.
  - The range is $\{y \mid y \in \mathrm{R}\}$.
  - Vertical asymptotes occur at $x = \frac{\pi}{2} + n\pi$, $n \in \mathrm{I}$.
  - The domain is $\left\{x \mid x \neq \frac{\pi}{2} + n\pi, x \in \mathrm{R}, n \in \mathrm{I}\right\}$.
  - The x-intercepts occur at $x = n\pi$, $n \in \mathrm{I}$.
  - The y-intercept is 0.



$y = \tan \theta = \frac{y}{x}$



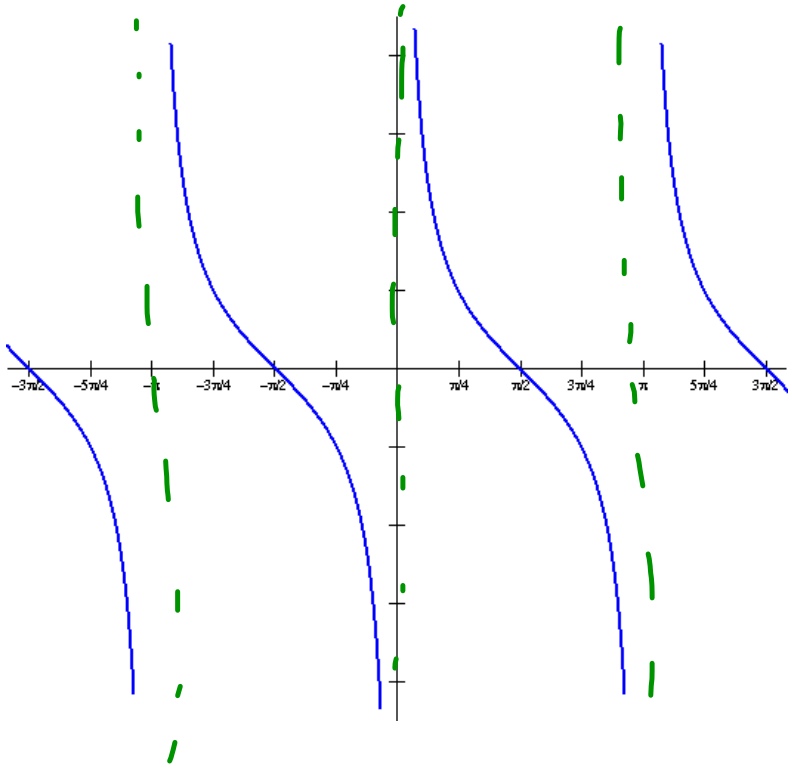
What would the graph of **cot θ** look like?

REMEMBER:

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

where tan x = 0,
cot x is undefined

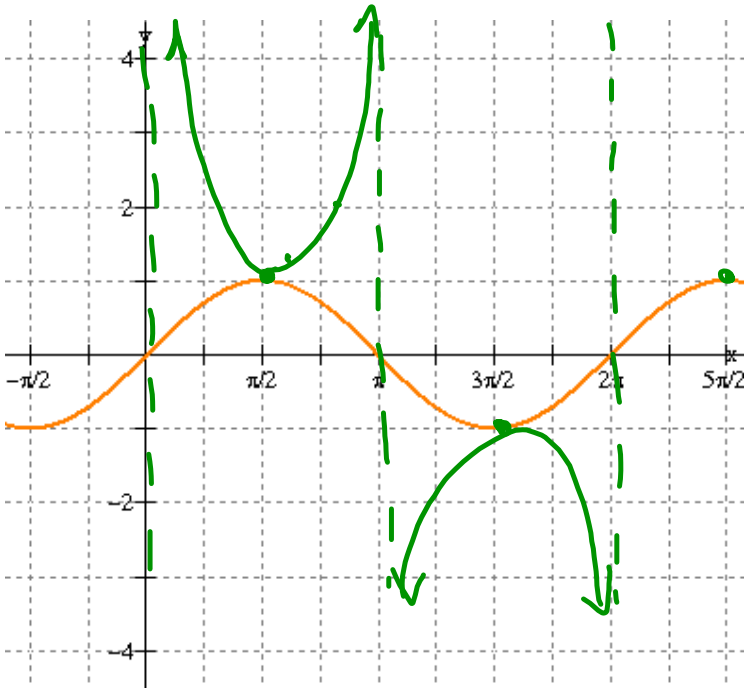
$y = \cot \theta$



Graphs of Other Trigonometric Functions

$\frac{0}{\#}$ $\frac{\#}{0}$

$y = \sin \theta$



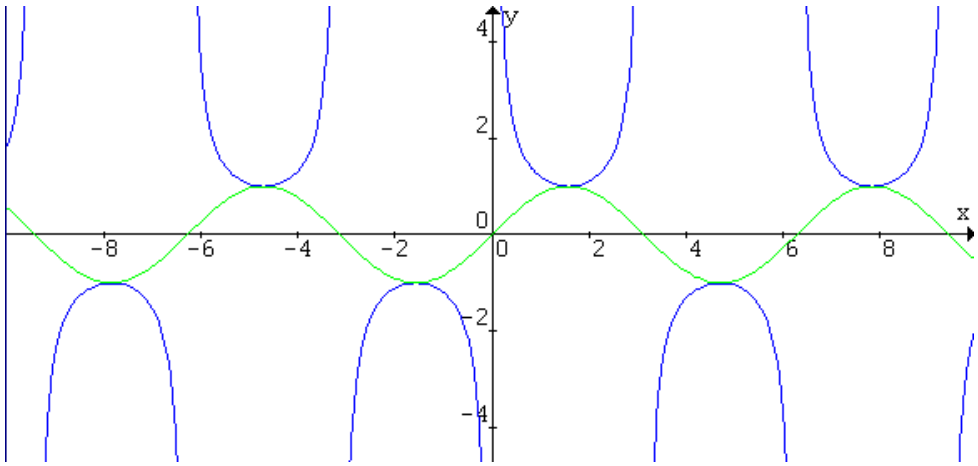
What would the graph of **csc θ** look like?

REMEMBER:

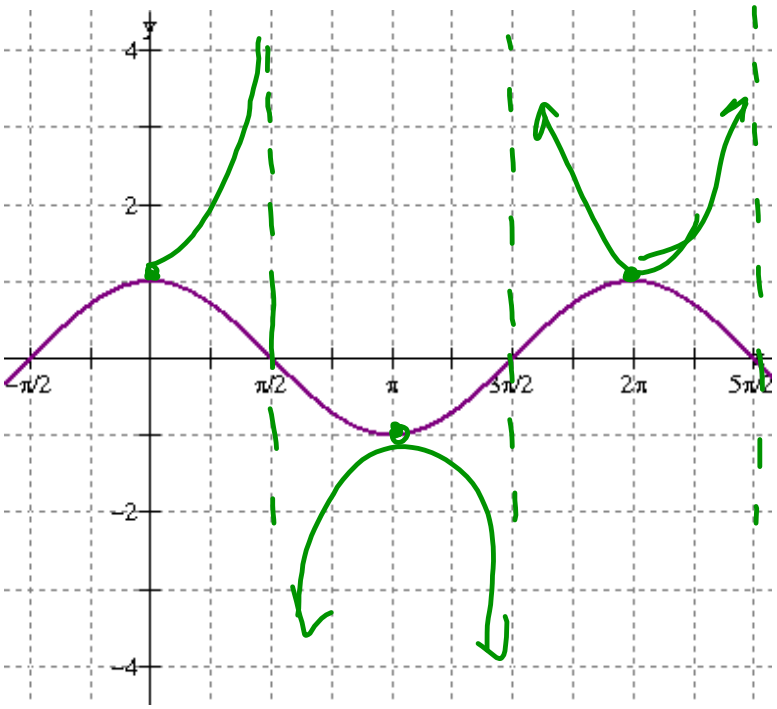
$$\csc\theta = \frac{1}{\sin\theta}$$

where sin x = 0,
csc x is undefined

$y = \sin x$ $y = \csc x$



y = cos θ



What would the graph of **sec θ** look like?

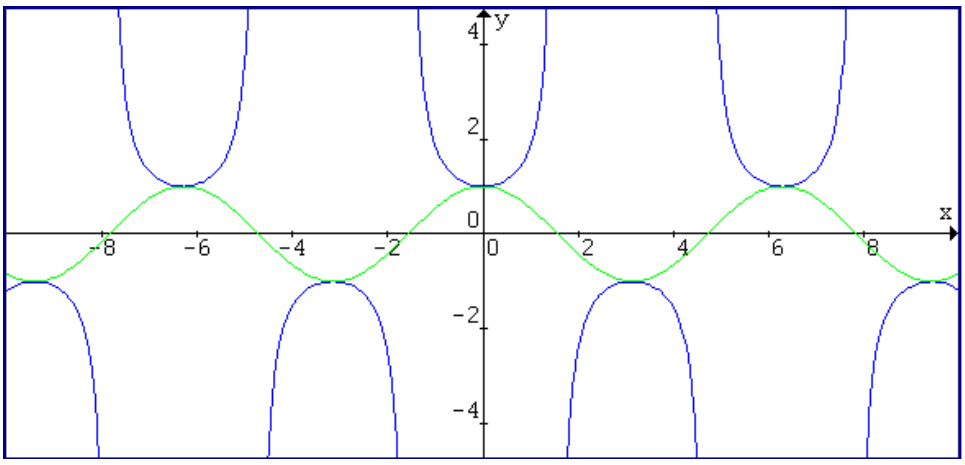
REMEMBER:

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

where cos x = 0,
sec x is undefined

y = cos x

y = sec x



REVIEW - Sketching Trigonometric Functions

- sinusoidal functions
  - properties: domain/range, amplitude, period, phase shift, vertical translation, eq'n of sinusoidal axis, mapping notation.
  - sketching equation in standard form.

Asst:

- finding the function (both a sine/cosine) given a graph
- solving trigonometric equations where period is not 360
- applications of sinusoidal functions.
  - sketch
  - develop a function
  - use function to answer question
- sketches of all SIX trigonometric ratios

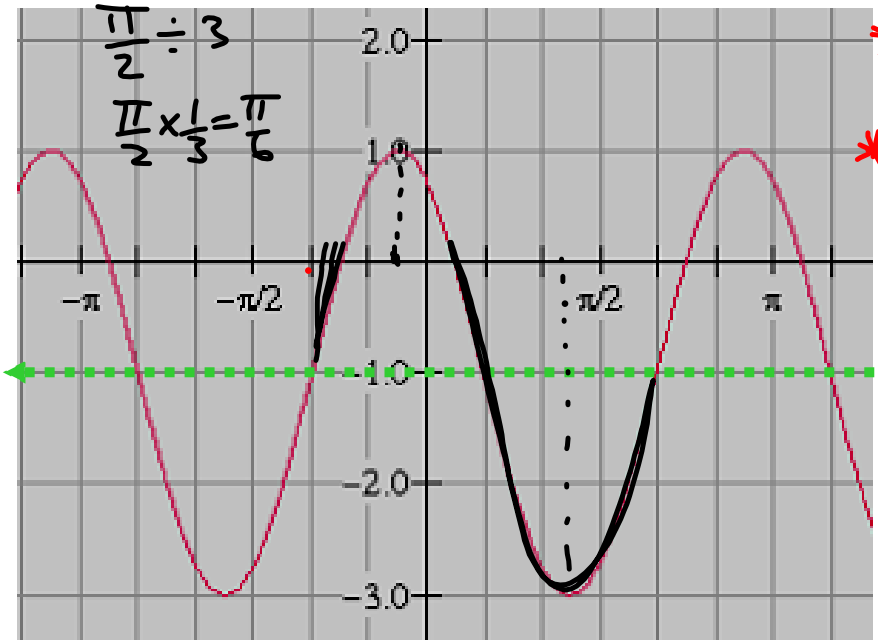
Textbook Review....

Pg. 282 - 285

#4, 6, 7, 8, 10, 11, 20, 21, 22, 23, 24

Practice Test: Page 286 - 287
#1 - 7
#11, 12, 14, 15, 16

Write both a cosine and sine function to describe the graph shown



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

$\frac{\pi}{2} \times \frac{1}{3} = \frac{\pi}{6}$

* Amp = 2

* Ver. shift = down 1

↓ Down 1

* Period: $6 \times \frac{\pi}{6} = \pi$

$\frac{2\pi}{\pi} = \frac{k\pi}{\pi}$

$k = 2$

$y = 2\sin[2(\theta + \frac{\pi}{3})] - 1$ ($-\frac{2\pi}{3}$)

$y = -2\sin[2(\theta - \frac{\pi}{6})] - 1$

-2

$y = 2\cos[2(\theta + \frac{\pi}{12})] - 1$ ($-\frac{5\pi}{12}$)

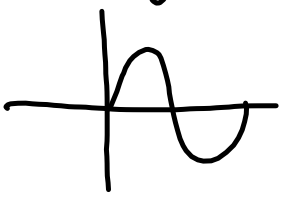
Complete the chart shown below and sketch one full cycle of this function

$$-\frac{1}{2}(y+2)=\sin\left(3\theta+\frac{\pi}{8}\right)-2$$

$$y+2=-2\sin\left(3\left(\theta+\frac{\pi}{24}\right)\right)+4$$

$$y=-2\sin\left(3\left(\theta+\frac{\pi}{24}\right)\right)+2$$

DOMAIN	$\theta \in \mathbb{R}$
RANGE	$0 \le y \le 4$
AMPLITUDE	2
PERIOD	$120°$ OR $\frac{2\pi}{3}$
PHASE SHIFT	$\frac{\pi}{24}$ left
VERTICAL TRANSLATION	up 2
EQUATION OF SINUSOIDAL AXIS	$y=2$



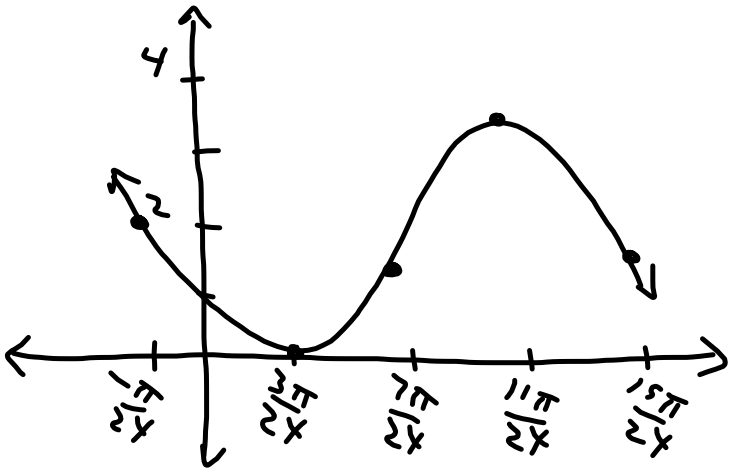
x	y
0	0
$\pi/2$	1
π	0
$3\pi/2$	-1
2π	0

$$(x,y)\rightarrow\left(\frac{1}{3}x-\frac{\pi}{24},-2y+2\right)$$

x	y
$-\frac{\pi}{24}$	2
$\frac{3\pi}{24}$	0
$\frac{7\pi}{24}$	2
$\frac{11\pi}{24}$	4
$\frac{15\pi}{24}$	2

$\frac{\pi}{6}-\frac{\pi}{24}=\frac{4\pi}{24}-\frac{\pi}{24}=\frac{3\pi}{24}$

$\frac{\pi}{3}-\frac{\pi}{24}=\frac{8\pi}{24}-\frac{\pi}{24}=\frac{7\pi}{24}$

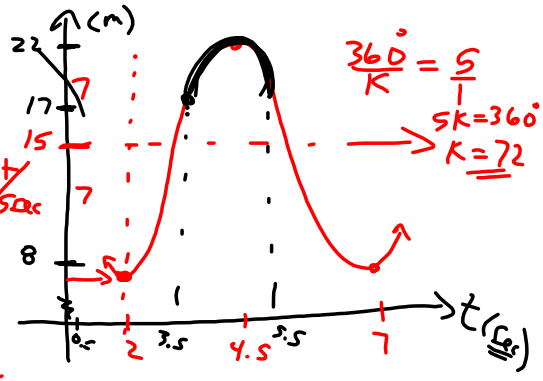


The Canadian National Historic Windpower Centre, at Etzikom, Alberta, has various styles of windmills on display. The tip of the blade of one windmill reaches its minimum height of 8 m above the ground at a time of 2 s. Its maximum height is 22 m above the ground. The tip of the blade rotates 12 times per minute.

a) Write a sine or a cosine function to model the rotation of the tip of the blade.

b) What is the height of the tip of the blade after 4 s? 20.66

c) For how long is the tip of the blade above a height of 17 m in the first 10 s?



$\frac{360°}{K} = \frac{5}{1}$

$5K = 360°$

$K = 72$

1 Rot / 5 sec

(a) $y = -7\cos(72(t-2)) + 15$

(b) $y = -7\cos(72(4-2)) + 15$

$= 20.66\text{ m}$

(c) $17 = -7\cos(72(t-2)) + 15$

Period = 5

$\frac{17-15}{-7} = \cos(72(t-2))$

$\cos^{-1}\left(\frac{-2}{7}\right) = 72(t-2)$

(Ref $\measuredangle$ = 73.4, Q2,3)

x	A
	x

Q2

$180 - 73.4$

$\frac{106.6}{72} = \frac{72(t-2)}{72}$

$\frac{106.6}{72} = t-2$

$\frac{106.6}{72} + 2 = t$

$t = 3.5\text{ sec}$

$(+5)$

$t = 8.5\text{ sec}$

Q3

$180 + 73.4$

$253.4 = 72(t-2)$

$\frac{253.4}{72} + 2 = t$

$t = 5.5\text{ sec}$

(-5)

$t = 0.5\text{ sec}$

$(+5)$

10.5

Total Time above 17 $\Rightarrow 0.5s + 2\text{ sec} + 1.5\text{ sec}$

$= 4\text{ sec}$