Unit 4 : Graphing Trig Functions

(in their initial state)

$f(x) = a\sin b(x-h) + k$

$f(x) = a\cos b(x-h) + k$

initially

$a = 1$ $h = 0$

$b = 1$ $k = 0$

Periodic Functions { $f(x) = \sin x$, $g(x) = \cos x$, $h(x) = \tan x$ } x-values expressed as radians

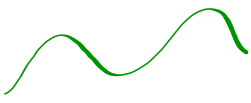
(Wave Functions)

$f(x) = f(x+P) = f(x+2P) = f(x+3P) = \ldots$

$f(x+kP)$

$k \in \mathbb{Z}$

$P(\pi)$ $(-1,0)$ $P(\pi+2\pi)$ $(-1,0)$ $P(\pi+4\pi)$ $(-1,0)$



$g(x) = g(x+2\pi) = g(x+4\pi)$

graph $f(x) = \sin x$

step i. identify the parameter and all info about function

$a = 1 \quad h = 0$

$b = 1 \quad k = 0$

$P = \frac{2\pi}{|b|}$

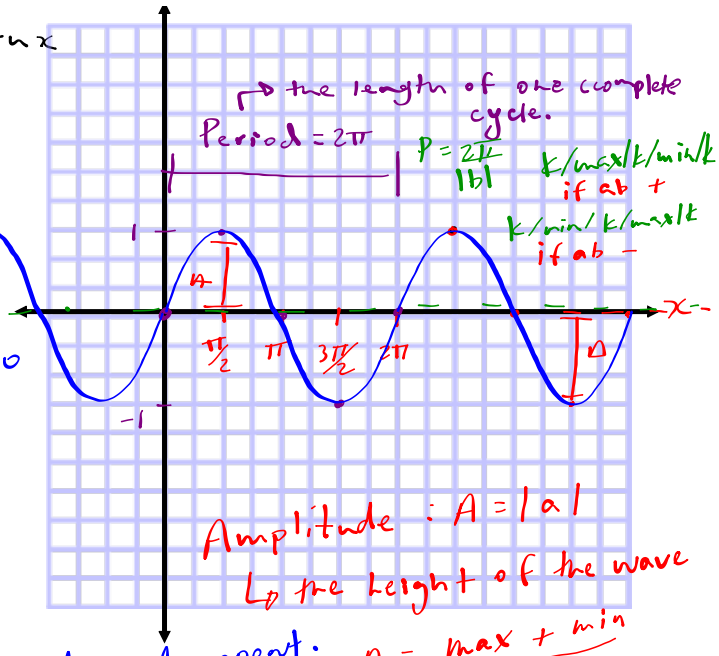
step ii. Construct TOV sin

x	y
h	k / k
$+\frac{P}{4}$	max/min
$+\frac{P}{4}$	k / k
$+\frac{P}{4}$	min/max
$+\frac{P}{5}$	k / k

when ab + when ab −

$y = \sin x$

x	y
0	$\sin 0 = 0$
$\pi/2$	1
π	0
$3\pi/2$	−1
2π	0



Amplitude : $A = |a|$

↳ the height of the wave

step iii. Plot point, draw one period and repeat.

$A = \frac{\max + \min}{2}$

Central Axis $y = k$

the horizontal the wave oscillates around.

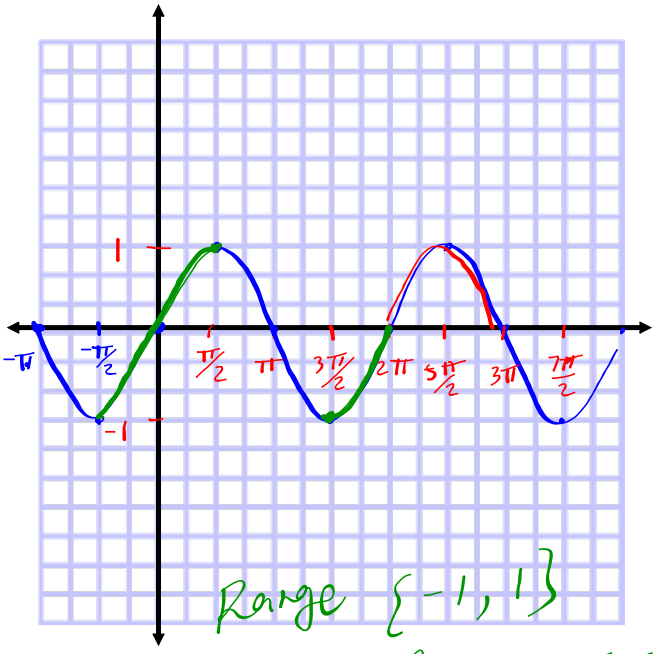
$y = \sin x$

$p = 2\pi$ max 1 min -1

k / max if / min / k

max = k + |a|

min = k - |a|



Range $\{-1, 1\}$

Domain $\mathbb{R}$

- max/min located at the halves of π.
- x-ints are located a the π with integer coefficients! (the wholes of π)

Q: Determine the positive interval of f(x) over the interval $[\frac{3\pi}{2}, 4\pi[$

$]2\pi, 3\pi[$

Q: Determine the increasing interval of f(x) over the interval $[-\pi, 2\pi[$

$]-\frac{\pi}{2}, \frac{\pi}{2}[\cup]\frac{3\pi}{2}, 2\pi[$

graph

$P = \frac{2\pi}{|b|}$

$P = 2\pi$

$A = |a|$

$A = 1$

$y = k$

$y = 0$

$y = \cos x$

x	y
h	max
$+P/4$	k
$+P/4$	min
$+P/4$	k
$+P/4$	max

/ min / k / max / k / min

if a +

if a -

$g(x) = \cos x$

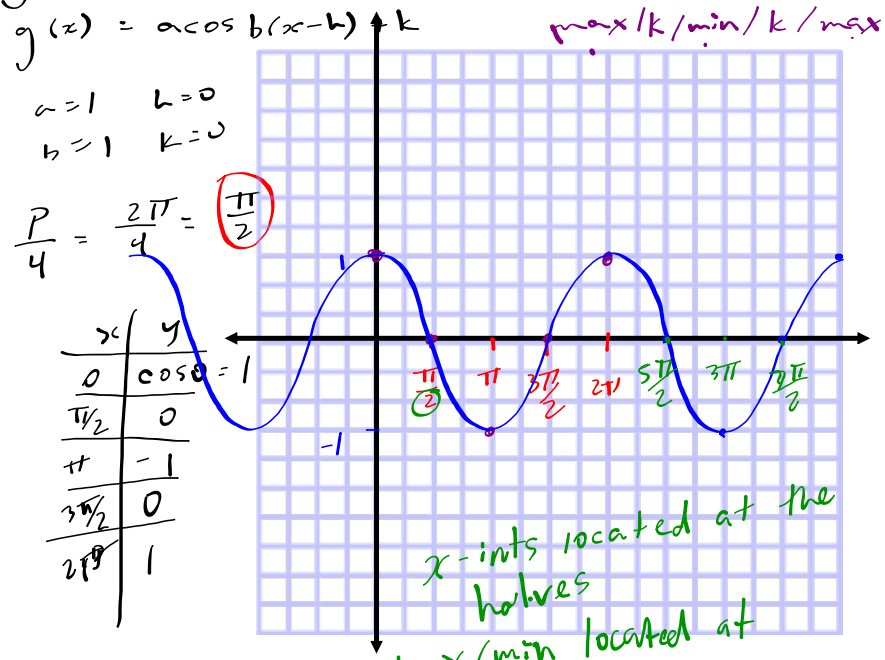
$g(x) = a\cos b(x-h) + k$

$a = 1 \quad h = 0$

$b = 1 \quad k = 0$

$\frac{P}{4} = \frac{2\pi}{4} = \frac{\pi}{2}$

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



x-ints located at the halves

max/min located at wholes of π.

QI

Q Determine the decreasing interval of $f(x) = \cos x$ for $[-4\pi, \pi]$

QII

Q Determine the negative interval of $f(x) = \cos x$ for $]\frac{3\pi}{2}, \frac{7\pi}{2}[$

if $h(x) = \sin x$ and $g(x) = \cos x$

QIII

. determine the interval over which $h(x)$ and $g(x)$ are simultaneously positive for $[0, 4\pi]$

QIV

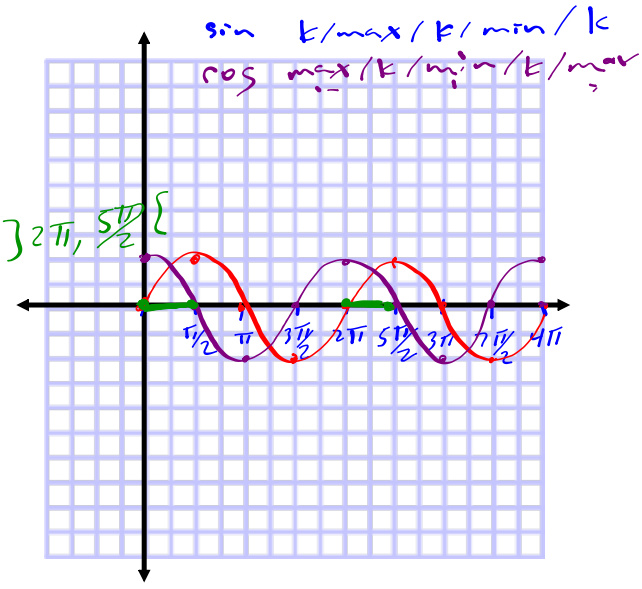
. determine the interval over which $h(x)$ and $g(x)$ are simultaneously increasing for $]-4\pi, -\pi[$

if $h(x) = \sin x$ and $g(x) = \cos x$

determine the interval over which $h(x)$ and $g(x)$ are simultaneously positive for

$[0, 4\pi]$

$]0, \pi/2[\cup]2\pi, 5\pi/2[$



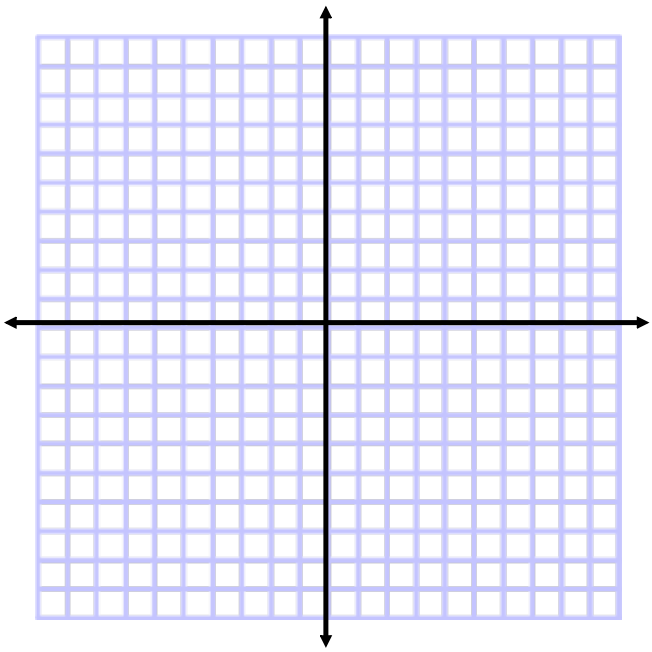
determine the interval over which $h(x)$ and $g(x)$ are simultaneously increasing for

$-4\pi, -\pi[$

if $h(x) = \sin x$ and $g(x) = \cos x$

determine the interval over which $h(x)$ and $g(x)$ are simultaneously positive for $[0, 4\pi]$

determine the interval over which $h(x)$ and $g(x)$ are simultaneously increasing for $-4\pi, -\pi[$



If $h(x) = \tan x$

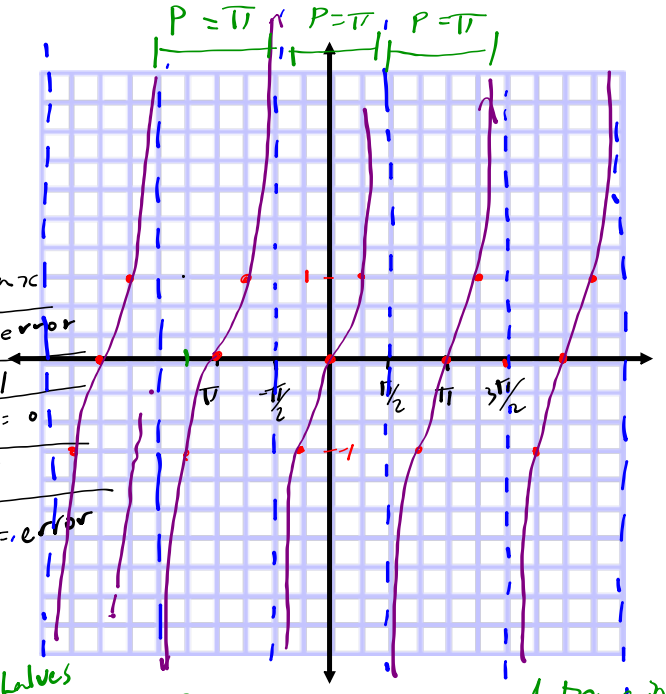
Find $h(\pi/2)$

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

x	$\sin x$	$\cos x$	$\tan x$
$-\pi/2$	-1	0	$\frac{-1}{0}$ error
$-\pi/4$	$-\sqrt{2}/2$	$\sqrt{2}/2$	-1
0	0	1	$\frac{0}{1} = 0$
$\pi/4$	$\sqrt{2}/2$	$\sqrt{2}/2$	1
$\pi/2$	1	0	$\frac{1}{0}$ = error

There are asymptotes at the values of π.

x-ints at the wholes of π



Range $\mathbb{R}$

Domain $\mathbb{R}$ ~ the values of π

$\mathbb{R} \sim k\frac{\pi}{2}$

QI Find domain

QII Determine the negative interval for $[-\frac{3\pi}{2}, \pi/2]$

QIII Determine the decreasing interval for $[0, 2\pi[$

#5 p 4.25

#6 p 4.26

#8 p 4.27