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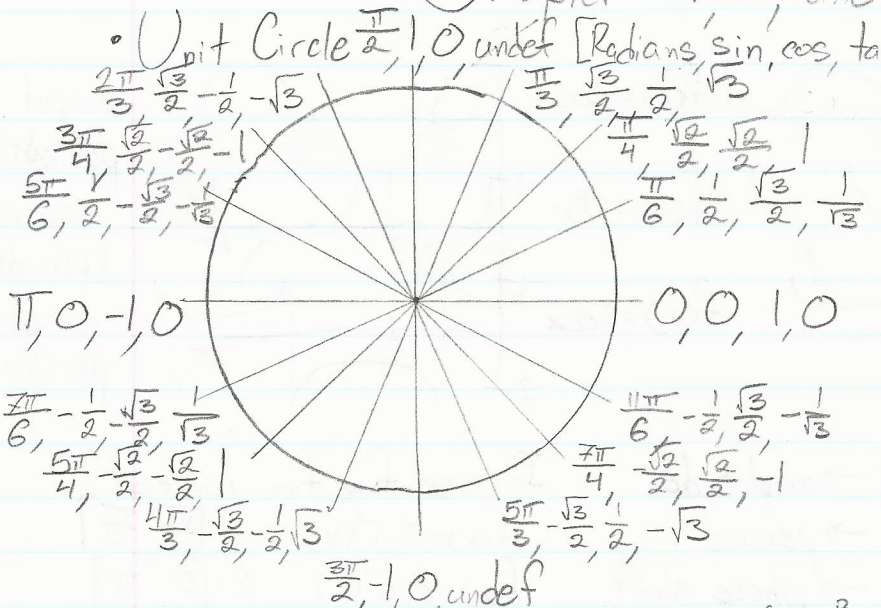
Mr. Fox
PreCalculus Honors

Chapter 4, 5, and 6 Summary

- Unit Circle [Radians, sin, cos, tan]



When solving right triangles:

SOH	CAH	TOA
i	o	a
n	p	j
e	p	o
o	d	a
p	j	d
p	a	j
o	c	a
s	e	e
i	n	t
t	u	t
e	s	e

cosine (II) | all (I)
tangent (III) | sine (IV)
... is positive

- Identities:

inverse:
- $\sec x = \frac{1}{\cos x}$
- $\csc x = \frac{1}{\sin x}$
- $\cot x = \frac{1}{\tan x}$
- $\tan x = \frac{\sin x}{\cos x}$

pythagorean:
- $\sin^2 x + \cos^2 x = 1$
- $1 + \tan^2 x = \sec^2 x$
- $1 + \cot^2 x = \csc^2 x$

reduction:

$\sin(-x) = -\sin x$	$\csc(-x) = -\csc x$	$\sin(\frac{\pi}{2} - x) = \cos x$
$\cos(-x) = \cos x$	$\sec(-x) = \sec x$	$\cos(\frac{\pi}{2} - x) = \sin x$
$\tan(-x) = -\tan x$	$\cot(-x) = -\tan x$	$\tan(\frac{\pi}{2} - x) = \cot x$

sum and difference:
- $\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$
- $\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$

double angle:
- $\sin(2u) = 2 \sin u \cos u$
- $\cos(2u) = \cos^2 u - \sin^2 u = 2\cos^2 u - 1 = 1 - 2\sin^2 u$

power reducing:
- $\sin^2 u = \frac{1 - \cos(2u)}{2}$
- $\cos^2 u = \frac{1 + \cos(2u)}{2}$

- Law of Sines: $\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c}$
  - SAA
  - ASA
  - SSA
- Law of Cosines: $c^2 = a^2 + b^2 - 2ab\cos\gamma$
  - SSS
  - SAS

standard form

90°, 270°

coterminal

There are infinite coterminal angles to angle x.

θ is the reference angle

- Ambiguous Case (ASS)

if θ is acute:
- H ≥ F, 1 Δ
- H < F sin θ, no Δ
- H = F sin θ, 1 Δ
- H > F sin θ, 2 Δ

if θ is obtuse:
- if H > F, 1 Δ
- if H ≤ F, no Δ

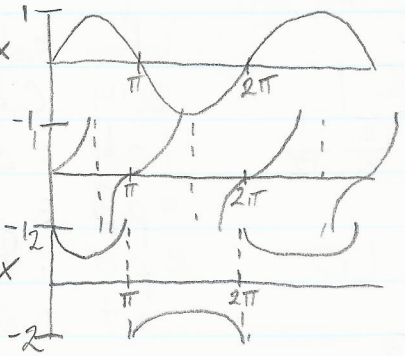
altitude = F sin θ

... and then use Law of Sines.

Graphs

amp: 1
period: 2π

$f(x) = \sin x$



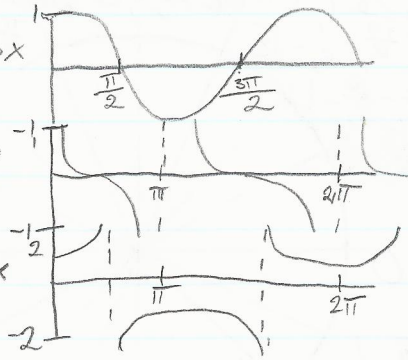
amp: none
period: π

$f(x) = \tan x$

amp: none
period: 2π

$f(x) = \csc x$

$f(x) = \cos x$



amp: 1
period: 2π

$f(x) = \cot x$

amp: none
period: π

$f(x) = \sec x$

amp: none
period: 2π

$f(x) = a\sin(bx+c)+K$

$|a| \rightarrow$ amplitude

$\frac{2\pi}{b} \rightarrow$ period

$c \rightarrow$ phase shift

$K \rightarrow$ vertical shift

Inverse function ranges

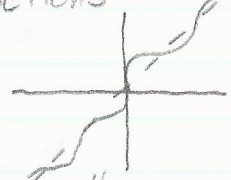
$f(x) = \sin^{-1}(x)$ $R: [-\frac{\pi}{2}, \frac{\pi}{2}]$

$f(x) = \cos^{-1}(x)$ $R: [0, \pi]$

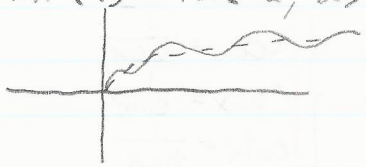
$f(x) = \tan^{-1}(x)$ $R: (-\frac{\pi}{2}, \frac{\pi}{2})$

"Wrapping functions"

$f(x) = x + \sin x$

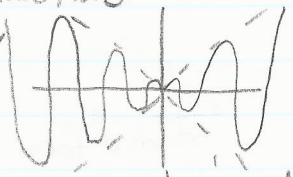


$f(x) = \sqrt{x} + \sin x$

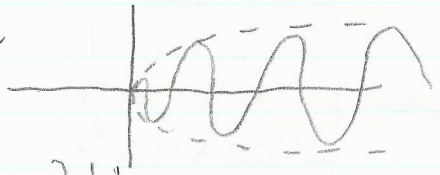


"Dampened functions"

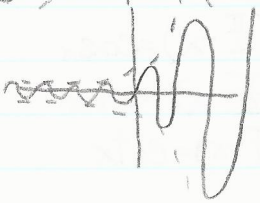
$f(x) = x\sin x$



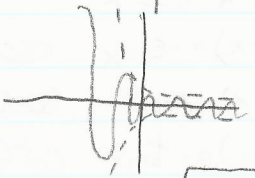
$f(x) = \sqrt{x}\sin x$



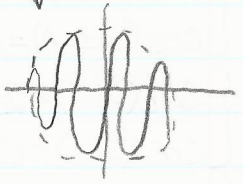
$f(x) = e^{x}\sin x$



$f(x) = e^{-x}\sin x$



$f(x) = \sqrt{25 - x^2}\sin x$



$S = r\theta$, S is arc length, r is radius length

$A = \frac{1}{2}r\theta$, A is area of sector,

$\omega = \frac{\theta}{t}$, ω is angular velocity

$v = r\omega$, v is linear velocity