Agenda

Review of Quiz #9/10

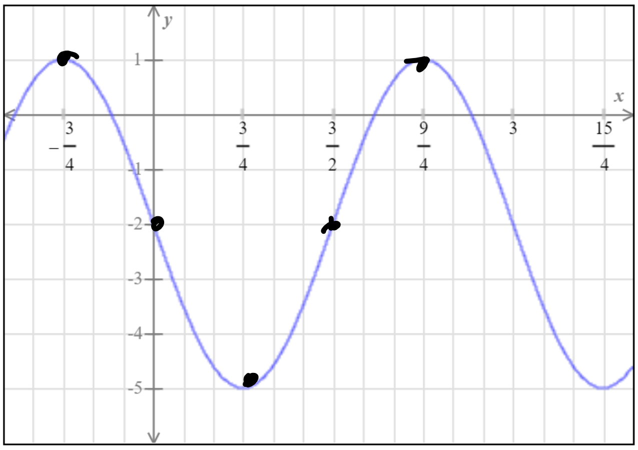
Inverse Trig Functions

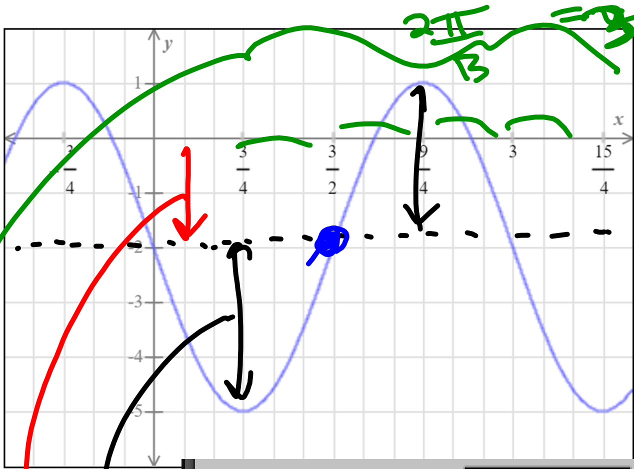
Right Triangle

Identities

Sum and Difference Formulas

Quiz 10 Review


y
x
1
-1
-2
-3
-4
-5
−3/4
3/4
3/2
9/4
3
15/4



SinReg
y=a*sin(bx+c)+d
a=3
b=2.094395102
c=3.141592654
d=-2

NORMAL FLOAT AUTO REAL DEGREE CL

2.094395102/π
.6666666665
Ans▸Frac
.6666666665
2/3
.6666666667

x	y
3/4	-5
3/2	-2
9/4	1
3	-2
15/4	-5

$\frac{-C}{2\pi/3} = \frac{3}{4}$

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

Period: $\frac{2\pi}{B}$

$B = \frac{2\pi}{\text{Period}} = \frac{2\pi}{3}$

$\sin(2.09\ldots x + \pi) - 2$

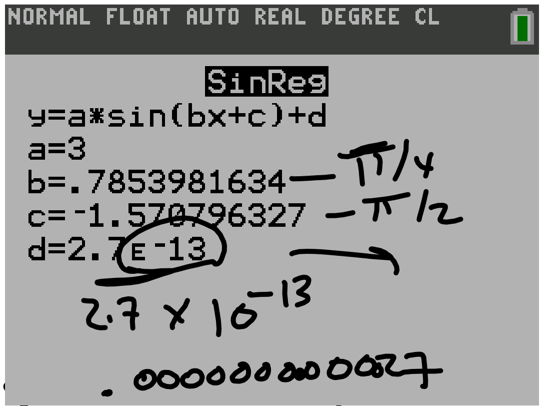
$\frac{2\pi}{3}$

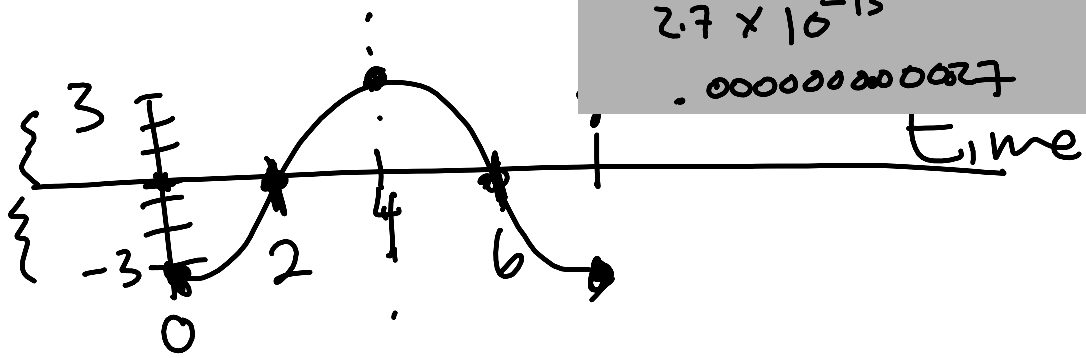
$y = 3\sin\left(\frac{2}{3}x + \pi\right) - 2$

A buoy floating in the ocean is bobbing in simple harmonic motion with amplitude 3 ft and period 8 seconds. Its displacement d from sea level at time $t = 0$ seconds is -3 ft, and initially it moves upward. (Note that upward is the positive direction.)

Give the equation modeling the displacement d as a function of time t.

0	-3
2	0
4	3
6	0
8	-3

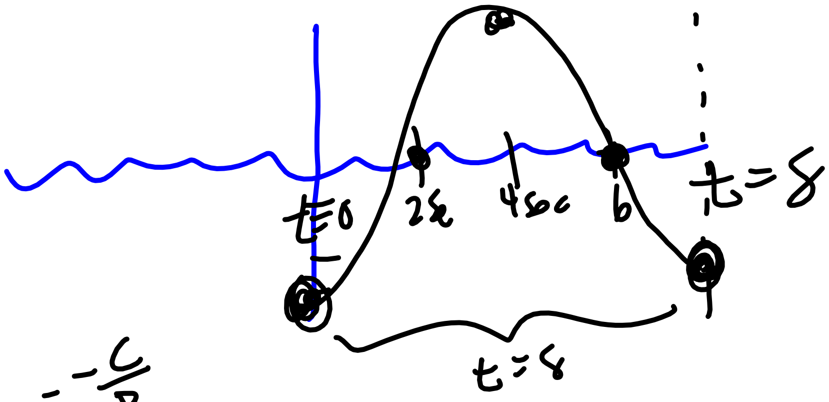




$$y = \underline{3}\sin\left(\frac{\pi}{4}x - \frac{\pi}{2}\right) + \underline{0}$$

A buoy floating in the ocean is bobbing in simple harmonic motion with amplitude 3 ft and period 8 seconds. Its displacement d from sea level at time $t = 0$ seconds is -3 ft, and initially it moves upward. (Note that upward is the positive direction.)

Give the equation modeling the displacement d as a function of time t.



x	y
0	-3
2	0
4	3
6	0
8	-3

Sinreg

$P.S = 2\,sec = -\frac{C}{B}$

$-2\left(\frac{\pi}{4}\right)$

$\frac{2\pi}{B} = 8$

$y = 3\sin\left(\frac{\pi}{4}x - 1.57\right)$

.785..

A buoy floating in the ocean is bobbing in simple harmonic motion with amplitude 3 ft and period 8 seconds. Its displacement d from sea level at time $t = 0$ seconds is -3 ft, and initially it moves upward. (Note that upward is the positive direction.)

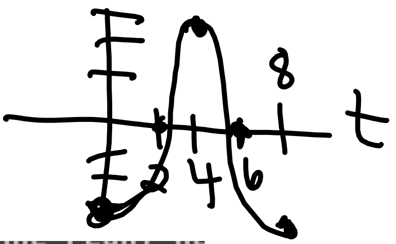
$A = 3 \longrightarrow$

$\text{Period} = 8 = \frac{2\pi}{B} \rightarrow \frac{2\pi}{8}$

$t = 0$

$h = -3$

Give the equation modeling the displacement d as a function of time t.



L1	L2
0	-3
2	0
4	3
6	0
8	-3

y=a*sin(bx+c)+d
a=3 ←
b=.7853981634 ← $\pi/4$
c=-1.570796327 ← $-\pi/2$
d=~~2.7E-13~~ → 0

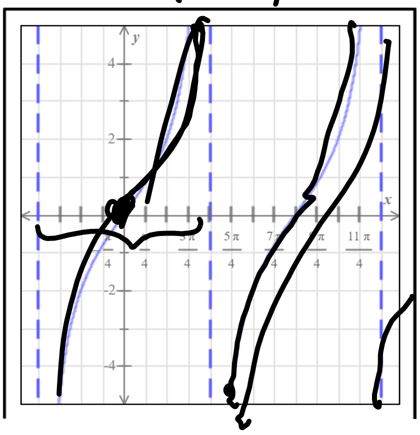
$d = 3\sin\left(\frac{\pi}{4}x - \frac{\pi}{2}\right)$

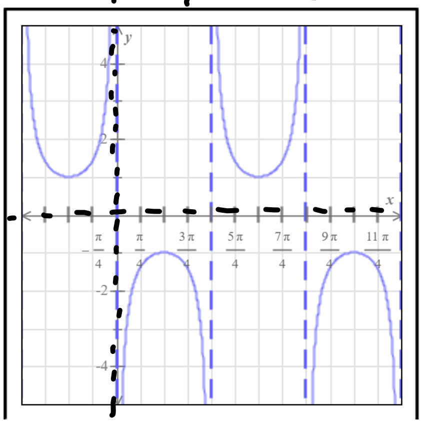
$d = -3\cos\left(\underset{\frac{\pi}{4}}{B}x\right) \quad \frac{2\pi}{B} = 8$

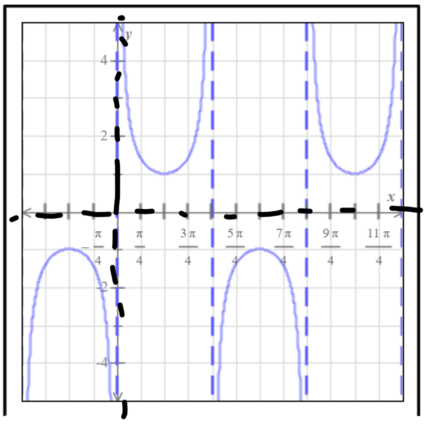
$y = 2\tan\frac{x}{2}$ $\quad$ $y = \csc x$ $\quad$ $y = \cancel{\cot\left(x + \frac{\pi}{4}\right)}$

$y = \sec\left(x + \frac{\pi}{4}\right)$ $\quad$ $y = \underline{2\tan x}$ $\quad$ $y = -\csc x$

tan / cot $\qquad$ sec / csc

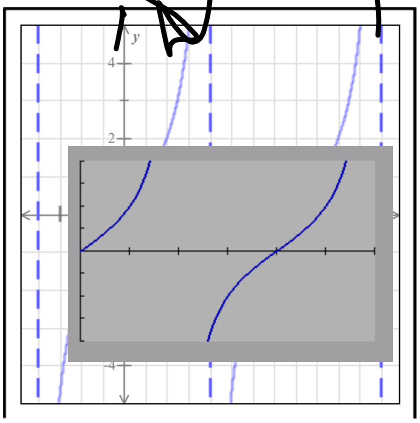


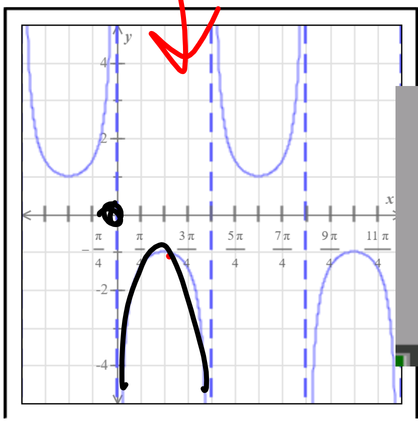


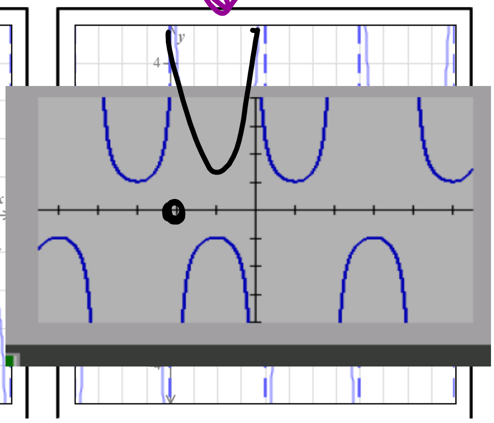


$y = 2\tan\frac{x}{2}$ $\quad y = \csc x$ $\quad y = \cot\left(x+\frac{\pi}{4}\right)$

$y = \sec\left(x+\frac{\pi}{4}\right)$ $\quad \cancel{y = 2\tan x}$ $\quad y = -\csc x$







Graph the function $y = 2\cos\left(\frac{2}{3}x + \frac{\pi}{3}\right)$.

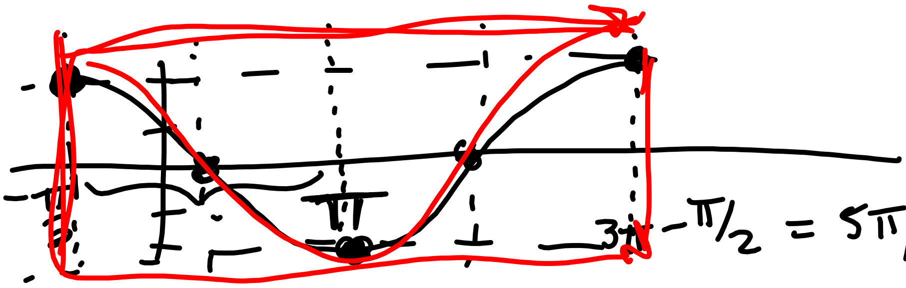
$= 0$

③ Amp: 2

② Period $2\pi / \frac{2}{3} = 3\pi$

① P.S. $\frac{2}{3}x + \frac{\pi}{3} = 0 \rightarrow 2x = -\pi$

$x = -\pi/2$



$3\pi - \pi/2 = 5\pi/2$

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

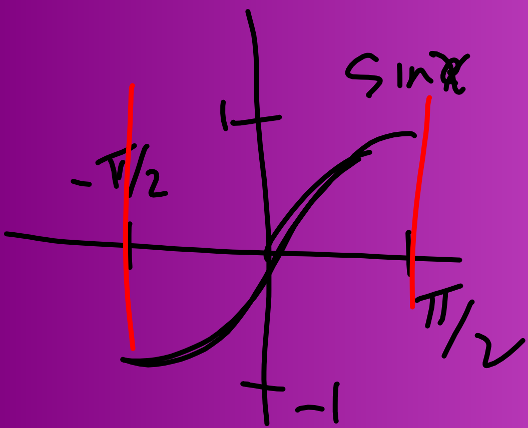
Inverse Trig Functions

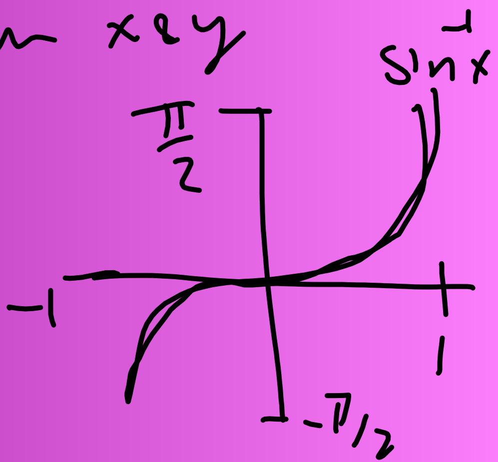
$y = \sin x$

$\sin^{-1}(y) = x$

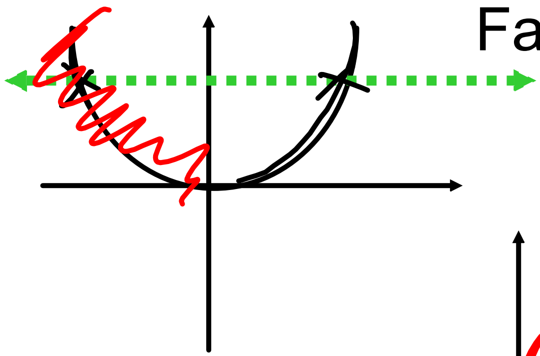
Solve for x

switch x & y

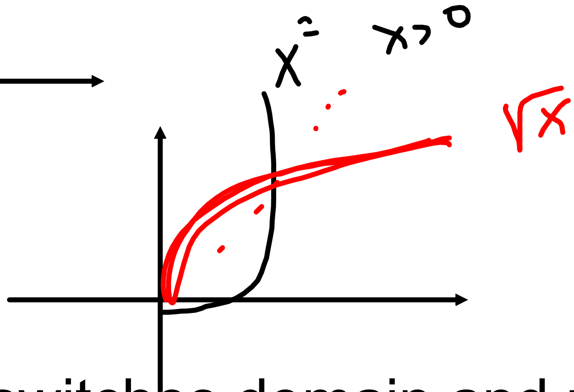




Inverse Functions



Fails Horizontal Line Test

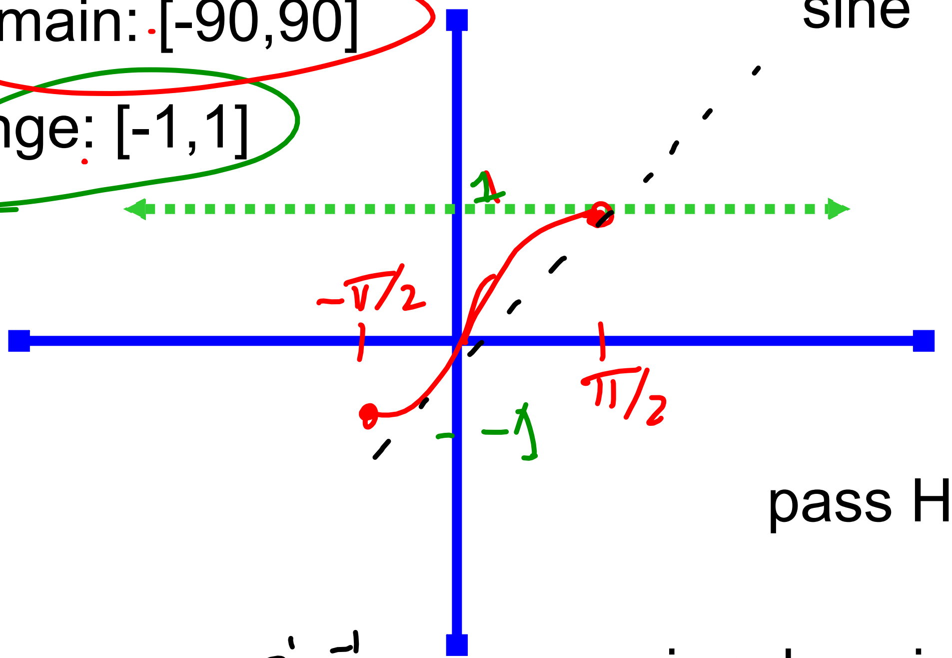


switches domain and range

domain: [-90,90]

range: [-1,1]

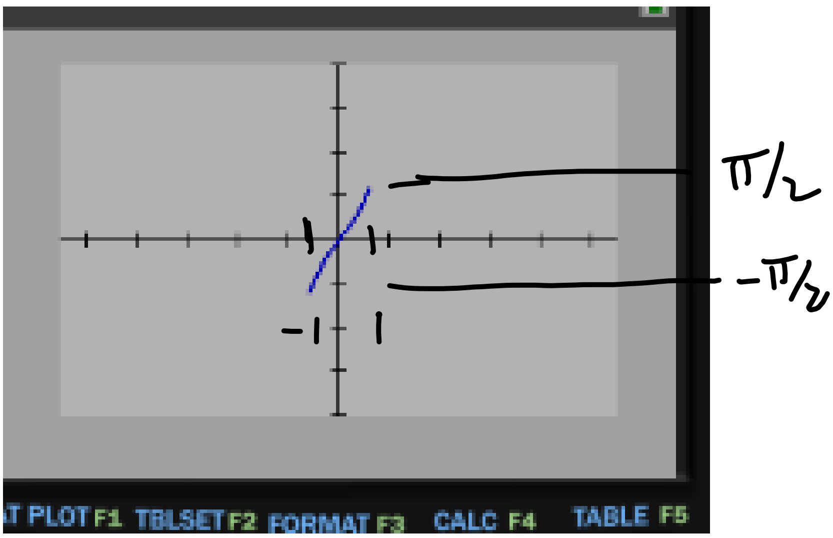
sine



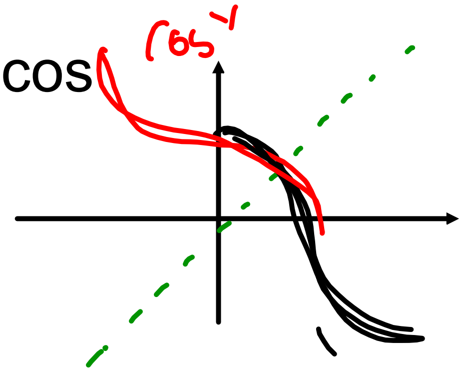
pass HLT ✓

$\sin^{-1} x$ = arcsinx domain[-1,1]

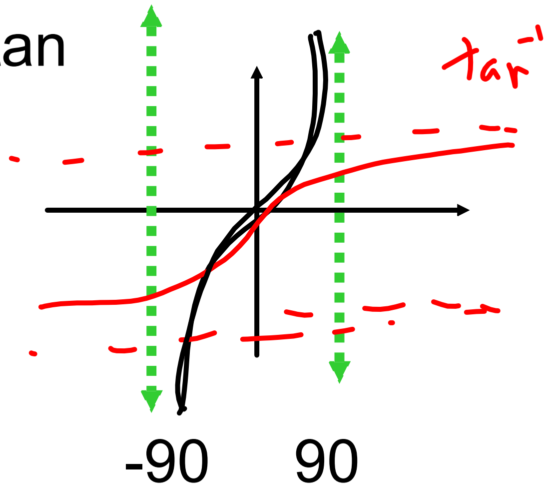
range:[-90,90]



cos



tan

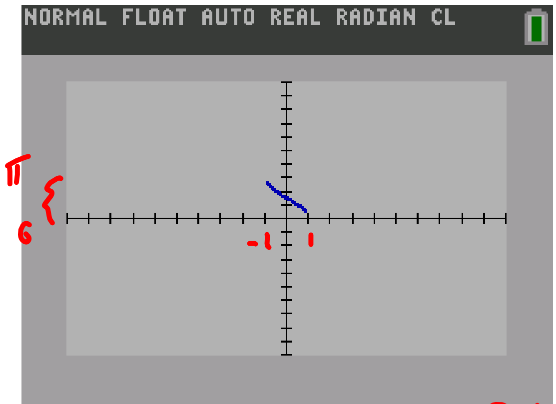


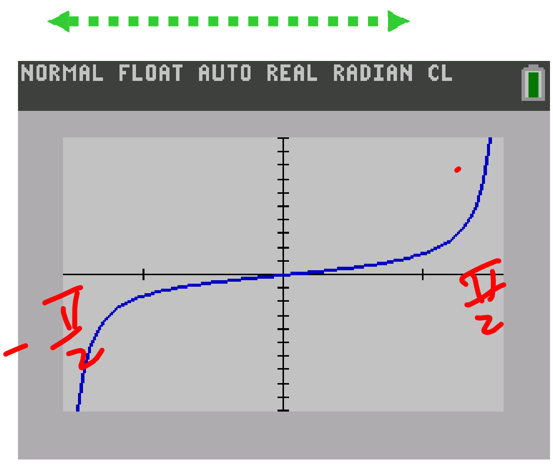
domain [0,180°]

range [-1,1]

domain[-90°,90°]

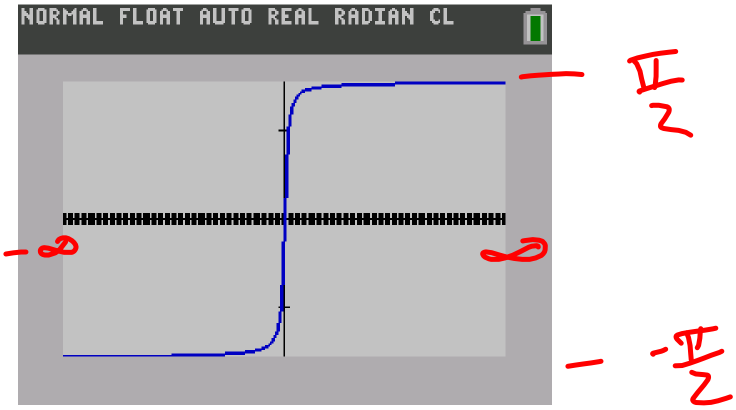
range:(-oo,oo)





$\cos^{-1}$ Domain $[-1,1]$
Range $[0,\pi]$

$\tan^{-1}$ Domain: $(-\infty,\infty)$
Range: $[-\frac{\pi}{2},\frac{\pi}{2}]$
$[-90°, 90°]$


NORMAL FLOAT AUTO REAL RADIAN CL
π/2
-∞
∞
-π/2

Input # Value/y

$$\sin x = y$$

Inverse

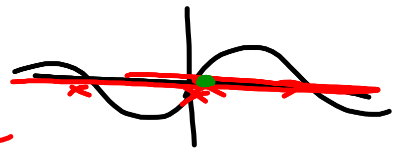
\# or Value/y

$$x = \sin^{-1} y$$

```
                .5235987756
π/6
                .5235987756   radians
sin⁻¹(.5)
                .5235987756   radians
sin⁻¹(.5)
                         30   degrees
```

$$\sin^{-1}(.5) = \theta$$

$$\tfrac{1}{2} = \sin\theta$$



$$\sin x = 1/2$$

$$x = \sin^{-1}(1/2)$$

$$\sin\left(\tfrac{\pi}{6}\right) = .5$$

$$\sin^{-1}(.5) = \pi/6 = 30^\circ$$

Values of inverse trigonometric functions

Find the exact value of $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$.

Write your answer in radians in terms of π.

$\theta =$

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

	0°	30°	45°	60°	90°
sin	0	1/2	$\sqrt{2}/2$	$\sqrt{3}/2$	1

$\theta = 60^\circ$ or $\pi/3$

Degrees

$60^\circ \cdot \frac{\pi}{180^\circ} = \frac{\pi}{3}$

Radians

$= 1.04 / \pi = .3333$

MATH 1Dfr → 1/3

$1.04 = \frac{1}{3}\pi$ or $\pi/3$

Values of inverse trigonometric functions

Find the exact value of $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$. $= \theta$

Write your answer in radians in terms of π.

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

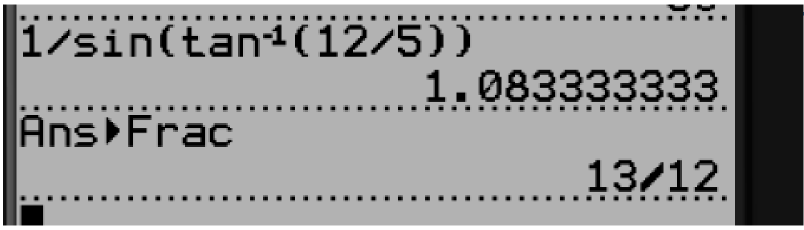
in degree

```
sin⁻¹(√(3)/2)
                                60°
```

$60° \cdot \frac{\pi}{180°} = \frac{\pi}{3}$

Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 1

Find the exact value of $\csc\left(\tan^{-1}\left(\frac{12}{5}\right)\right)$.



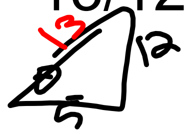
Composition of a trigonometric function with the inverse of another trigonometric function: Problem type 1

Find the exact value of $\csc\left(\tan^{-1}\left(\frac{12}{5}\right)\right)$.

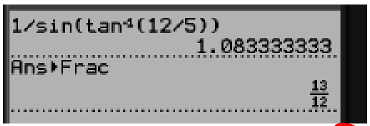
$\tan^{-1}\left(\frac{12}{5}\right) = \theta$

Explain

$1/\sin(\tan^{-1}(12/5)) =$ hyp/opp = 13/12



$\tan\theta = \frac{12}{5}$ $\frac{\text{opp}}{\text{adj}}$



θ

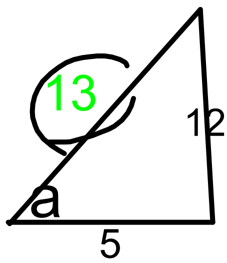
angle = $\tan^{-1}(12/5)$

tan(angle) = 12/5

SOH

CAH

TOA



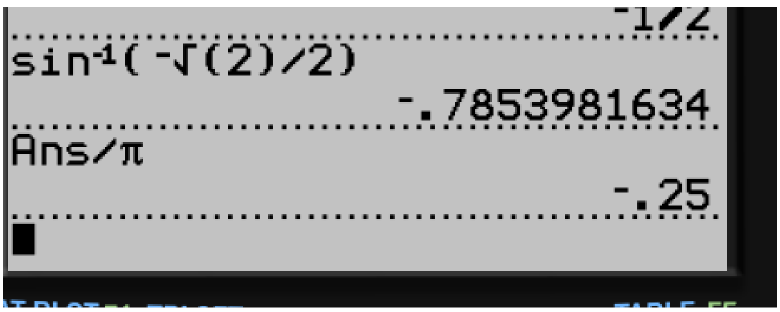
tan=opp/adj

$\frac{1}{\sin\theta} = \frac{\text{hyp}}{\text{opp}} = \frac{13}{12}$

=

Find the exact value of $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$. $= -\frac{\pi}{4}$

Write your answer in radians in terms of π.



Rewrite $\cos\left(\sin^{-1}3w\right)$ as an algebraic expression in w.

$\theta = \sin^{-1}(3w)$

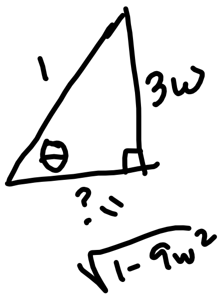
$\sin\theta = 3w$ SOH

$\sin\theta = \frac{opp}{hyp} = \frac{3w}{1}$

$\cos\theta$

CAH

$\cos\theta = \frac{adj}{hyp} = \frac{\sqrt{1-9w^2}}{1}$



$?^2 + (3w)^2 = 1$

$?^2 = 1 - 9w^2$

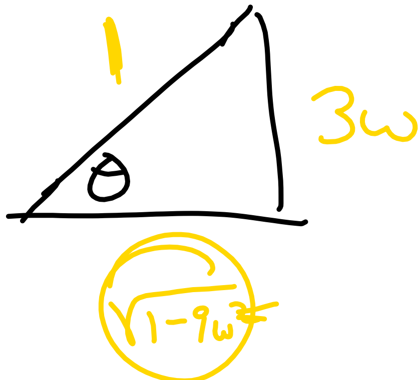
$? = \sqrt{1-9w^2}$

QUESTION

Rewrite $\cos\left(\sin^{-1} 3w\right)$ as an algebraic expression in w.

$$\theta = \sin^{-1}(3w)$$

$$\sin(\theta) = \frac{3w}{1} = \frac{opp}{Hyp}$$



$$?^2 + (3w)^2 = 1$$

$$?^2 = 1 - 9w^2$$

$$\cos(\theta) = \frac{adj}{hyp} \longrightarrow \frac{\sqrt{1-9w^2}}{1}$$

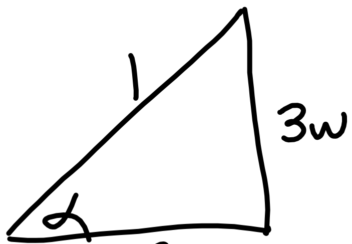
QUESTION

$= \sqrt{1-9w^2}$

Rewrite $\cos\left(\underbrace{\sin^{-1}3w}_{\alpha}\right)$ as an algebraic expression in w.

$\sin^{-1}3w = \alpha$

$\frac{\text{opp}}{\text{hyp}} = \frac{3w}{1} = \sin\alpha$



?

$?^2 + (3w)^2 = 1^2$

$?^2 = 1 - 9w^2$

$? = \sqrt{1-9w^2}$

$\cos\alpha = \frac{\text{adj}}{\text{hyp}}$

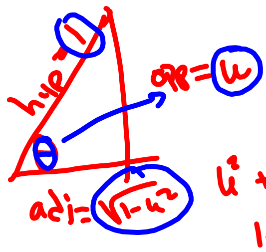
$= \sqrt{1-9w^2}$

Rewrite $\cot(\overbrace{\sin^{-1} u}^{=\theta})$ as an algebraic expression in u.

$\sin^{-1} u = \theta$

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

SOH



$u^2 + a^2 = 1$

$1 - u^2$

$$\cot\theta = \frac{1}{\tan\theta} = \frac{1}{O/A} = \frac{\text{adj}}{\text{opp}} = \frac{\sqrt{1-u^2}}{u}$$

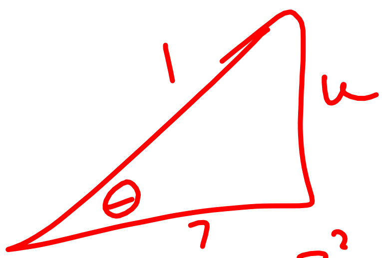
Rewrite $\cot\left(\sin^{-1} u\right)$ as an algebraic expression in u.

θ

$\theta = \sin^{-1} u$

$\sin\theta = \frac{u}{1} = \frac{opp}{hyp}$

$\cot\theta = \frac{1}{\tan\theta} = \frac{adj}{opp}$



$$\cot(\sin^{-1} u) = \frac{\sqrt{1-u^2}}{u}$$

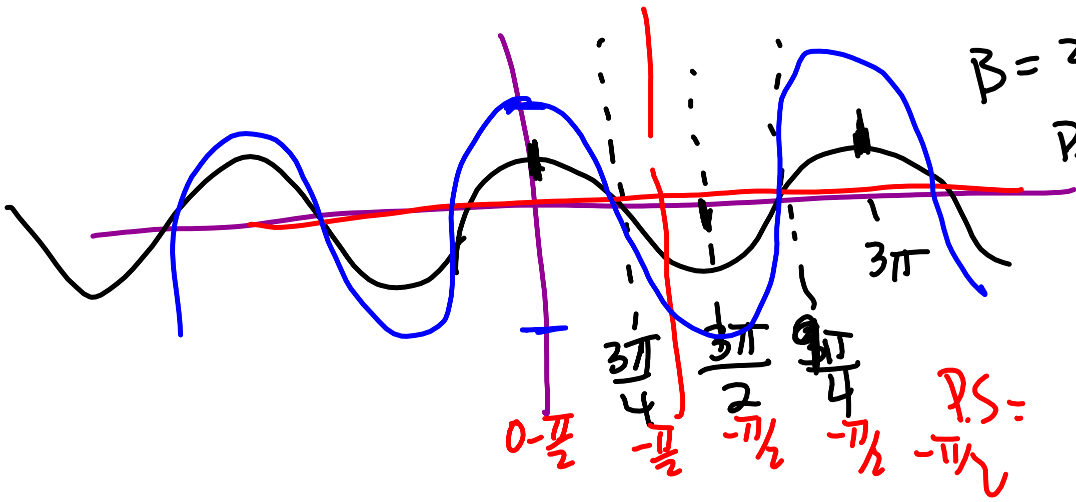
$?^2 + u^2 = 1$

$?^2 = 1 - u^2$

$? = \sqrt{1-u^2}$

$= 0$ $\quad 2x+\pi=0$
$x=-\pi/2$

Graph the function $y = 2\cos\left(\frac{2}{3}x + \frac{\pi}{3}\right)$.



$B = 2/3$

Period $= \frac{2\pi}{B}$

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

$= 3\pi$

Values of inverse trigonometric functions

Find the exact value of $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$. $= 60^\circ$ In degree

```
sin⁻¹(√3/2)
                60°
```

Write your answer in radians in terms of π.

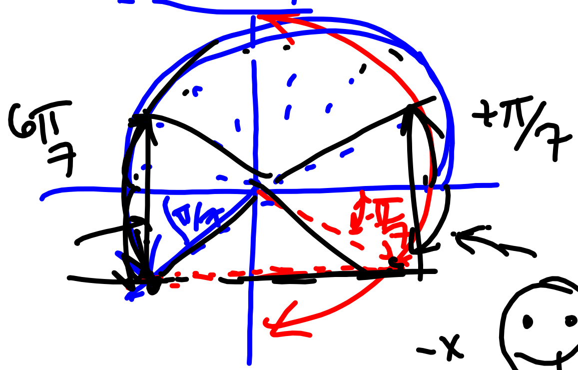
$\sin(60^\circ) = \sqrt{3}/2$.

Radian

```
sin⁻¹(√3/2)
        1.047197551
π/3
        1.047197551
```

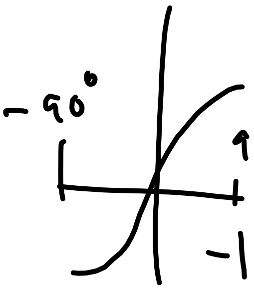
$60 \cdot \frac{\pi}{180} = \frac{\pi}{3}$

$$\sin^{-1}\left(\sin\left(\frac{8\pi}{7}\right)\right) = -\frac{\pi}{7}$$

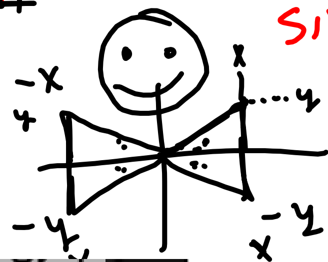


$\sin\left(-\frac{\pi}{7}\right)$

$\sin\left(\frac{8\pi}{7}\right)$



$-1 \leq \sin(\alpha) \leq 1$




```
sin⁻¹(sin(8π/7))
                    -.4487989505
Ans/π
                    -.1428571429
Ans▶Frac
                            -1/7
```

Right Triangle Trig

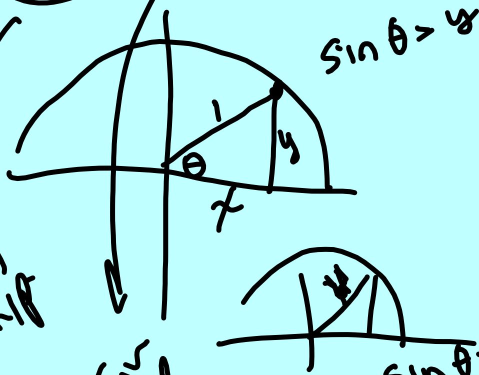
SOH CAH TOA

sin
opp
Hyp

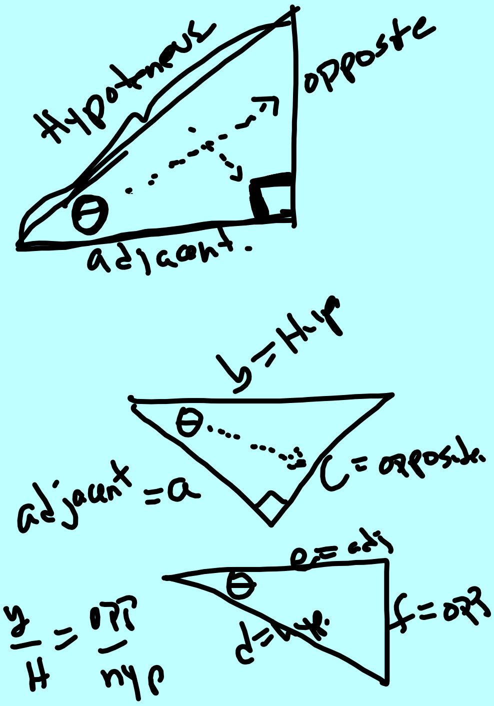
cos
adj
Hyp

tan
opp
adj

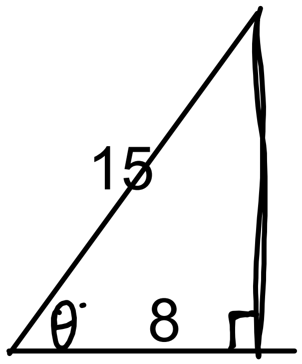
$\sin\theta = y$



$\sin\theta = \frac{y}{H} = \frac{opp}{hyp}$



Right Triangle Trig



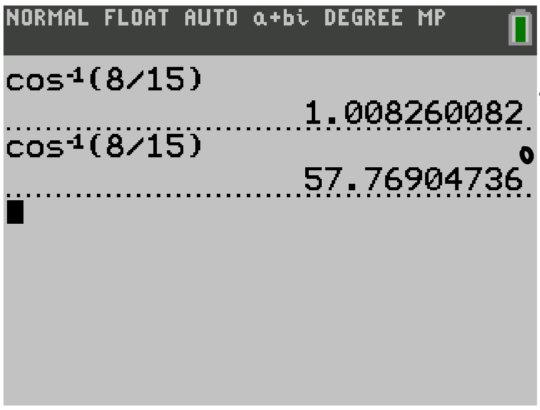
15 = hypotenuse

8 = adjacent

~~SOH~~ $\boxed{\text{CAH}}$ ~~TOA~~

$$\cos\theta = \frac{adj}{hyp} = \frac{8}{15}$$

$$\theta = \cos^{-1}\left(\frac{8}{15}\right)$$



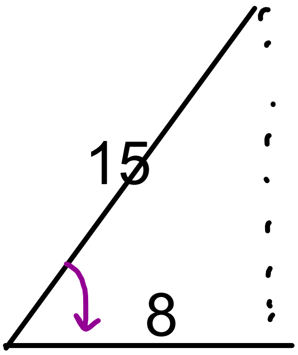
rad.

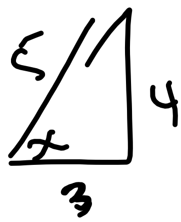
°

Right Triangle Trig

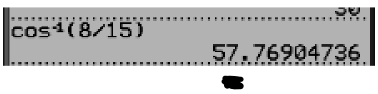
SOH. CAH . TOA

$$\frac{\text{adj}}{\text{hyp}} = 8/15 = \cos(a)$$

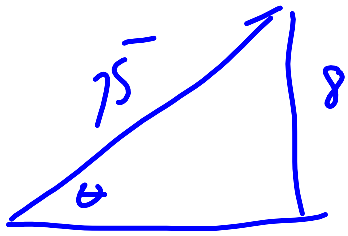


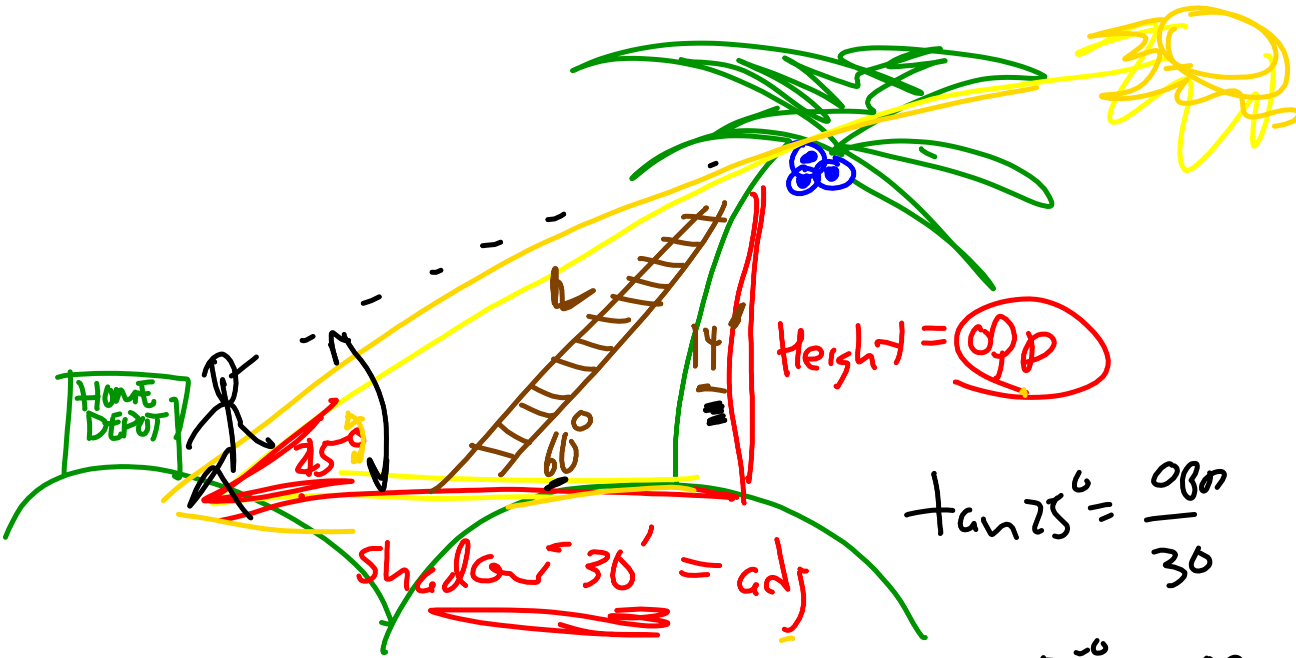


$$a = \cos^{-1}(8/15) =$$



$$\tan^{-1}\left(\frac{4}{3}\right) = 53^{6}$$





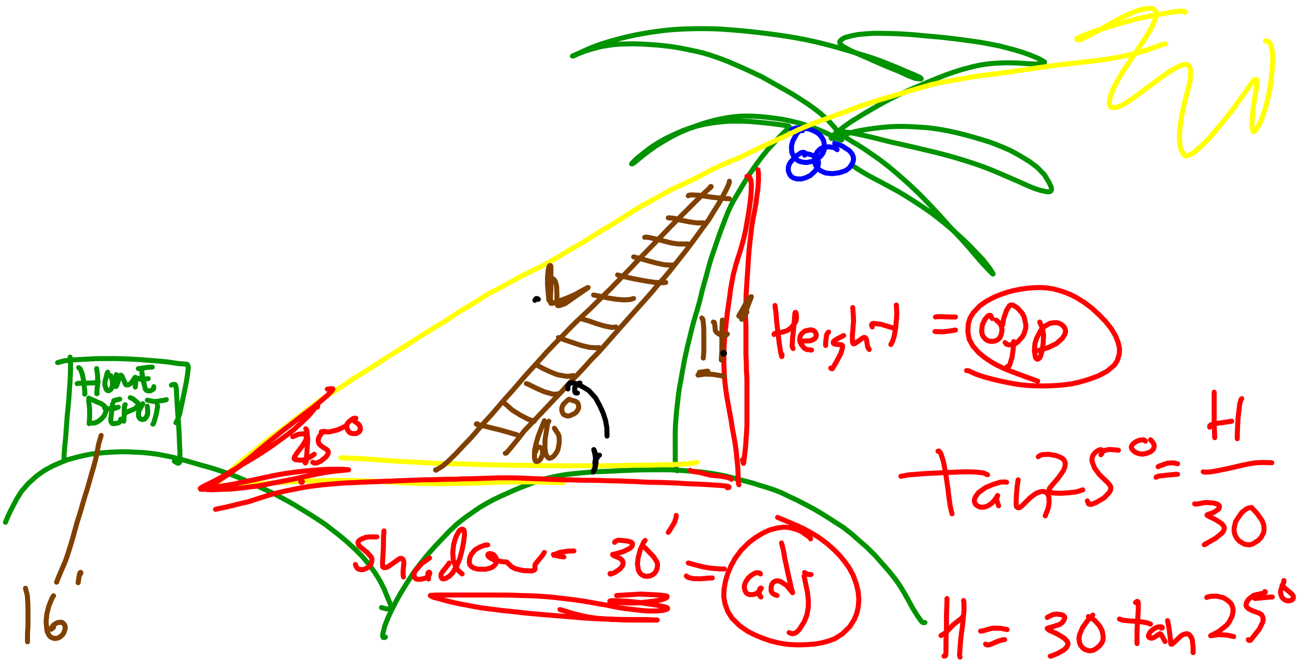
$$\tan 25^\circ = \frac{opp}{30}$$

$$14 = 30\tan 25^\circ = opp$$

Hyp = L
Opp = 14

$$\sin 60^\circ = \frac{14}{L}$$

$$L = \frac{14}{\sin 60^\circ} = 16.2$$



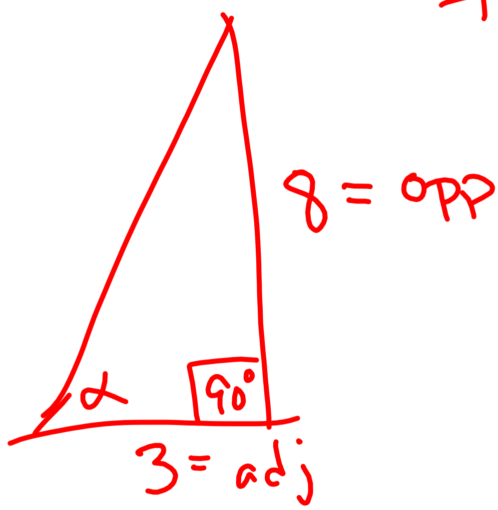
$$\tan 25° = \frac{H}{30}$$

$$H = 30 \tan 25°$$
$$= 13.9 \quad 14'$$

Hyp = L
Opp = 14

$$\sin 60° = \frac{14}{L} \quad \frac{opp}{hyp}$$

$$L = \frac{14}{\sin 60°} = 16.2$$



$$\tan\alpha = \frac{opp}{adj}$$

$$\tan\alpha = \frac{8}{3}$$

$$\alpha = \tan^{-1}\left(\frac{8}{3}\right)$$

IDENTITIES

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

$$\tan\theta \equiv \frac{\sin\theta}{\cos\theta}$$

✓ Condition

$x + 1 = 2$

$-1 \quad -1$

$x = 1$

✓ Contradiction

$x + 1 = x + 2$

$-x \quad -x$

$1 \neq 2$

✓ Identity

$x + 1 = 2x + 1 - x$

$-1 \quad -1$

$0 = 0$

Study of Functions

1. Linear, Quad, Cubic...Polynomial
2. Rational Functions
3. Exponential
4. Inverse/Transformations/Composite
5. Logs
6. Trig Functions

Function: Job

Domain: x: input

Range: y : Output

Max/Min/Increasing/Decreasing

Asymptotes/End Behaviour

Geography of the Graph

Properties:

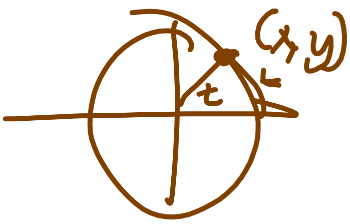
Log Properties

Trig Properties....

sin(t)=y

cos(t)=x

tan(t)=y/x



Reciprocol Identities

1/y= 1/sin(t) = csc(t)

1/x= 1/cos(t) = sec(t)

x/y= 1/tan(t) = cot(t)

1/csc(t) = sin(t)

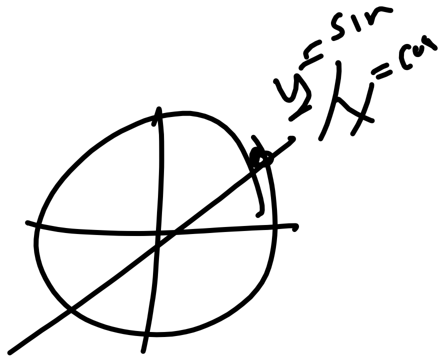
1/sec(t) = cos(t)

1/cot(t) = tan(t)

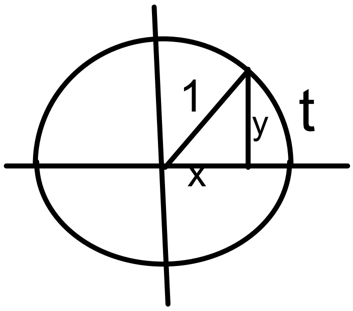
Quotient Identies

Tan(t)= sin(t)/ cos(t)

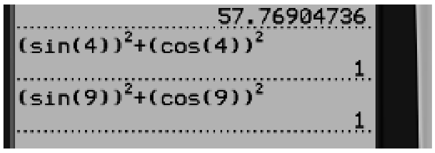
cot(t) = cos(t)/ sin(t)



Pythagorean Identities



$x^2+y^2=1$



☆ $\boxed{\cos^2(t)+\sin^2(t)=1}$

$$\frac{\cos^2(t)}{\cos^2(t)} + \frac{\sin^2(t)}{\cos^2(t)} = \frac{1}{\cos^2(t)}$$

☆ $\boxed{1 \quad + \quad \tan^2(t) \ = \sec^2(t)}$

$\cot^2(t) + 1 = \csc^2(t)$

Important Notation

$$(\sin(x))^2 = \sin^2 x$$

NOT $\sin x^3 = \sin(x^3) = \sin(x \cdot x \cdot x)$

$$\sin^3(x) = (\sin x)^3$$

$$= (\sin x)(\sin x)(\sin x)$$

$$\sin^{-1}(x) = \text{inverse } \sin$$

$(\sin(x))^{-1}$

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

$$\frac{1}{\sin^2(x)} = \csc^2 x$$

$$\sin^{-2}(x) = \frac{1}{\sin^2(x)} = \csc^2(x)$$

Simplifying trigonometric expressions

Simplify.

$\sec x - \sin^2 x \sec x$

Use algebra and the fundamental trigonometric identities.
Your answer should be a number or use a single trigonometric function.

$\sec x\,(1 - \sin^2 x)$

$(\cancel{\sin^2 x} + \cos^2 x - \cancel{\sin^2 x})$

$\sec x \cdot \cos^2 x$

$\frac{1}{\cos x} \cdot \cos^2 x = \frac{\cancel{\cos x} \cdot \cos x}{\cancel{\cos x}} = \cos x$

$\cos x$

Simplifying trigonometric expressions

Simplify.

$$\sec x - \sin^2 x \sec x = \cos x$$

Algebra = factorin

Use algebra and the fundamental trigonometric identities.
Your answer should be a number or use a single trigonometric function.

$\sec(x)\,(1 - \sin^2 x)$

Pythagorean Idenity

$\sec(x)\,[\cancel{\sin^2 x} + \cos^2 x - \cancel{\sin^2 x}]$

Algebra

$\sec x \cdot \cos^2 x$

Rociprocal

$\frac{1}{\cos x} \cdot \cos^2 x$

Algebra

$\cos x$

$\frac{1}{\cancel{x}} \cdot \frac{\cancel{x^2}}{1} = x$

Simplifying trigonometric expressions

Simplify.

$y = \sec x - \sin^2 x \sec x$ $= \cos x = y$

Use algebra and the fundamental trigonometric identities.
Your answer should be a number or use a single trigonometric function.

$\sec x(1 - \sin^2 x)$ factoring

$\sec x(\cancel{\sin^2 x} + \cos^2 x - \cancel{\sin^2 x})$ pythagorean id

$\sec x \cos^2 x$ algebra

$\frac{1}{\cancel{\cos x}} \cancel{\cos^2 x}$ reciprocol

$\cos x$ algebra

Reciprocal identities:

$$\sin u = \frac{1}{\csc u} \qquad \cos u = \frac{1}{\sec u} \qquad \tan u = \frac{1}{\cot u}$$

$$\csc u = \frac{1}{\sin u} \qquad \sec u = \frac{1}{\cos u} \qquad \cot u = \frac{1}{\tan u}$$

Quotient identities:

$$\tan u = \frac{\sin u}{\cos u} \qquad \cot u = \frac{\cos u}{\sin u}$$

Pythagorean identities:

$$\sin^2 u + \cos^2 u = 1$$
$$\tan^2 u + 1 = \sec^2 u$$
$$\cot^2 u + 1 = \csc^2 u$$

Odd/Even function identities:

$$\sin(-u) = -\sin(u) \qquad \cos(-u) = \cos(u) \qquad \tan(-u) = -\tan(u)$$

$$\csc(-u) = -\csc(u) \qquad \sec(-u) = \sec(u) \qquad \cot(-u) = -\cot(u)$$

Odd

$$f(-x) = -f(x)$$

Ex $y = 4x^3$

$y(-x) = 4(-x)^3 = -4x^3$

Even

$f(-x) = f(x)$

Ex $y = 7x^2$

$y(-x) = 7(-x)^2 = 7x^2$

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

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

$$f(x) = 5x^3 + 2x^2$$

$$f(-x) = 5(-x)^3 + 2(-x)^2$$

$$= -5x^3 + 2x^2$$

$$\neq f(x) \quad \neq -f(x)$$

ODD

$$\sin x = x^1 - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

EVEN

$$\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!}$$

$\sin(-x) = -\sin x$ ODD

$\cos(-x) = \cos x$ EVEN

$\tan(-x) = -\tan x$ ODD

$\sec(-x) = \sec(x)$ Even

Verifying a trigonometric identity

Complete the proof of the identity by choosing the Rule that justifies each step.

$$(1+\cot^2 x)\tan x = \boxed{\csc x}\sec x$$

$\boxed{\text{Pythagorean ID}}$

$\csc^2 x \quad \tan x$

$\boxed{\csc x} \cdot \csc x \cdot \tan x$

$\boxed{\text{Reciprocal}}$

$\csc x \cdot \frac{1}{\sin x} \tan x$

$\boxed{\text{Quotient}}$

$\csc x \cdot \frac{1}{\cancel{\sin x}} \cdot \frac{\cancel{\sin x}}{\cos x}$

$\boxed{\text{Alg.}}$

$\csc x \cdot \frac{1}{\cos x}$

$\boxed{\text{Reciprocal}}$

$\csc x \cdot \sec x$

Verifying a trigonometric identity

Complete the proof of the identity by choosing the Rule that justifies each step.

$$(1+\cot^2 x)\tan x = \csc x \sec x$$

Pythagorean ID

$\csc^2 x \cdot \tan x$

Quotient

$\csc^2 x \quad \dfrac{\sin x}{\cos x}$

Reciprocal

$\csc x \cdot \dfrac{1}{\cancel{\sin x}} \cdot \dfrac{\cancel{\sin x}}{\cos x}$

Algebra

$\csc x \cdot \dfrac{1}{\cos x}$

Reciprocal

$\csc x \cdot \sec x$

Verifying a trigonometric identity

Complete the proof of the identity by choosing the Rule that justifies each step.

$$\left(1+\cot^2 x\right)\tan x = \csc x \sec x$$

$\csc^2 x \tan x =$ Pythagorean

$\csc^2 x \dfrac{\sin x}{\cos x}$ Quotient

$\csc^2 x \sin x \sec x$ Reciprocol

$\csc x \boxed{\csc x \sin x} \sec x$ algebra

$\csc x \dfrac{1}{\cancel{\sin} x} \cancel{\sin} x \sec x$ Reciprocol

$\csc x \sec x$ algebra

verify

Statement	Rule
$\left(1 - \sin^2 x\right) \csc x$	
$= \cos^2 x \csc x$	$\boxed{\text{Pythagorean}}$
$= \cos^2 x \left(\dfrac{1}{\sin x}\right)$	$\boxed{\text{Reciprocal}}$
$= \cos x \left(\dfrac{\cos x}{\sin x}\right)$	$\boxed{\text{Algebra}}$
$= \cos x \cot x$	$\boxed{\text{Quotient}}$

control

$\boxed{\text{Ctrl}}$ $\boxed{\text{C}}$

Paste.

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Prove the identity.

$$\left(1-\cos^2 x\right)\cot^2 x = \cos^2 x$$

Note that each Statement must be based on a Rule chosen from the Rule menu. To see a detai
select the corresponding question mark.

Statement	Rule
$\left(1 - \cos^2 x\right)\cot^2 x$	
$= \left(\sin^2 x\right)\cot^2 x$	Pythagorean
$= \left(\sin^2 x\right)\dfrac{\cos^2 x}{\sin^2 x}$	Quotient
$= \cos^2 x$	Algebra

Thank you, your proof is complete.

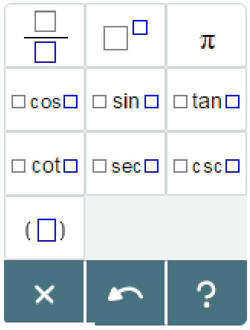
$= \frac{1}{\sin x} - \sin x$	Reciprocal
$= \frac{1 - \sin^2 x}{\sin x}$	Algebra
$= \frac{\cos^2 x}{\sin x}$	Pythagorean
$= \cos x \left(\frac{\cos x}{\sin x} \right)$	Algebra
$= \cot x \cos x$	Quotient

Statement	Rule
$= \dfrac{1}{\cos x} - \dfrac{\cos^2 x}{\cos x}$	Algebra
$= \dfrac{1 - \cos^2 x}{\cos x}$	Algebra
$= \dfrac{\sin^2 x}{\cos x}$	Pythagorean
$= \sin x \dfrac{\sin x}{\cos x}$	Algebra
$= \sin x \tan x$	Quotient

Thank you, your proof is complete.

Statement	Rule
$\sec^2 x\,(1 - \sin^2 x)$	
$= \sec^2 x\,(\cos^2 x)$	Pythagorean
$= \dfrac{1}{\cos^2 x}(\cos^2 x)$	Reciprocal

Click here to validate this line.



Statement	Rule
$\sec^2 x\,(1 - \sin^2 x)$	
$= \sec^2 x\,(\cos^2 x)$	Pythagorean
$= \dfrac{1}{\cos^2 x}(\cos^2 x)$	Reciprocal
$= 1$	Algebra

$$\sec x - \sin x \tan x = \cos x$$

Note that each Statement must be based on a Rule chosen from the Rule menu. To see a detailec
select the corresponding question mark.

Statement	Rule
$\sec x - \sin x \tan x$	
$= \dfrac{1}{\cos x} - \sin x \tan x$	Reciprocal
$= \dfrac{1}{\cos x} - \sin x \dfrac{\sin x}{\cos x}$	Quotient
$= \dfrac{1 - \sin^2 x}{\cos x}$	Algebra
$= \dfrac{\cos^2 x}{\cos x}$	Pythagorean
$= \cos x$	***Rule ?***

Statement	Rule
$\frac{\sin x}{1 - \cos x}$	
$= \frac{\sin x}{1 - \cos x} \frac{1 + \cos x}{1 + \cos x}$	Algebra
$= \sin x \frac{1 + \cos x}{1 - \cos^2 x}$	Algebra
$= \sin x \frac{1 + \cos x}{\sin^2 x}$	Pythagorean
$= \frac{1 + \cos x}{\sin x}$	Algebra

Statement	Rule
$= \sin x \frac{1 + \cos x}{\sin^2 x}$	Pythagorean
$= \frac{1 + \cos x}{\sin x}$	Algebra
$= \frac{1}{\sin x} + \frac{\cos x}{\sin x}$	Algebra
$= \csc x + \frac{\cos x}{\sin x}$	Reciprocal
$= \csc x + \cot x$	Quotient
Thank you, your proof is complete.	

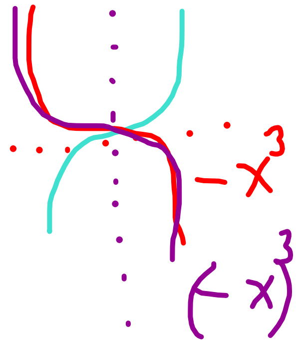
odd $f(-x) = -f(x)$ ex: $y = x^3$

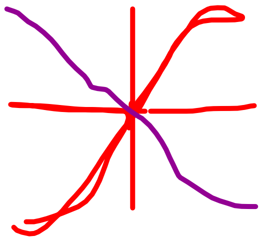
$\sin(-x) = -\sin x$

$(-x)^3 = -x^3$

even $f(-x) = f(x)$ ex: $y = x^2$

$\cos(-x) = \cos x$





$\sin(-x)$

$-\sin(x)$

sum and difference identities

$$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$$

$$\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$$

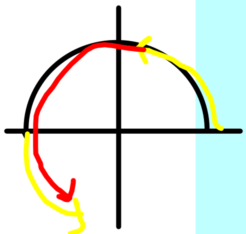
$$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$$

$$\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$$

$$= \frac{\sin(\alpha+\beta)}{\cos(\alpha+\beta)}$$

$$\tan(\alpha - \beta) = \frac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$$



$$\boxed{\sin(2x) = 2\sin x\cos x}$$

$$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$$

$$\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$$

$$\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$$

$$\tan(\alpha - \beta) = \frac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$$

cos(2x)=

$\cos^2 x - \sin^2 x$

Statement	Rul
$\cos\left(x - \frac{\pi}{3}\right) + \sin\left(\frac{\pi}{6} - x\right)$	
$= \cos(x)\cos\left(\frac{\pi}{3}\right) + \sin(x)\sin\left(\frac{\pi}{3}\right) + \sin\left(\frac{\pi}{6} - x\right)$	Sum and Diffe
$= \cos(x)\cos\left(\frac{\pi}{3}\right) + \sin(x)\sin\left(\frac{\pi}{3}\right) + \sin\left(\frac{\pi}{6}\right)\cos(x) - \cos\left(\frac{\pi}{6}\right)\sin(x)$	Sum and Diffe
$= \cos(x).5 + \sin(x)\frac{\sqrt{3}}{2} + .5\cos(x) - \frac{\sqrt{3}}{2}\sin(x)$	Evaluation
$= \cos x$	Algebra

Super Ugly

Prove the identity.

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

Note that each Statement must be based on a Rule chosen from the Rule menu. To see a deta corresponding question mark.

Statement	Rule
$\frac{\cos(x-y)}{\sin x \cos y}$	
$= \frac{\cos x \cos y + \sin x \sin y}{\sin x \cos y}$	Sum and Difference
$= \frac{\cos x \cos y}{\sin x \cos y} + \frac{\sin x \sin y}{\sin x \cos y}$	Algebra
$= \frac{\cos x}{\sin x} + \frac{\sin y}{\cos y}$	Algebra
$= \cot x + \tan y$	Quotient

$$\sin\left(\frac{\pi}{3}+x\right)-\cos\left(\frac{\pi}{6}+x\right)=\sin x$$

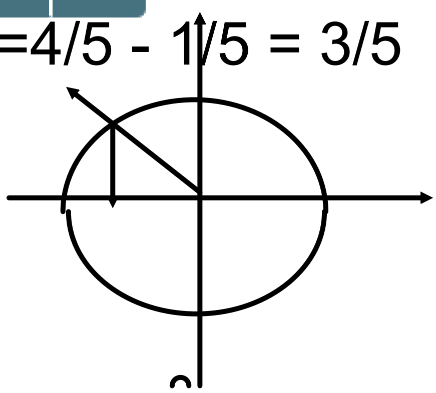
Statement	Rule
$\sin\left(\frac{\pi}{3}+x\right)-\cos\left(\frac{\pi}{6}+x\right)$	
$=\sin\left(\frac{\pi}{3}\right)\cos(x)+\sin(x)\cos\left(\frac{\pi}{3}\right)-\cos\left(\frac{\pi}{6}+x\right)$	Sum and Difference
$=\sin\left(\frac{\pi}{3}\right)\cos(x)+\sin(x)\cos\left(\frac{\pi}{3}\right)-\left(\cos\left(\frac{\pi}{6}\right)\cos(x)-\sin\right.$	Sum and Difference
$=\frac{\sqrt{3}}{2}\cos x+\frac{1}{2}\sin x-\frac{\sqrt{3}}{2}\cos x+\frac{1}{2}\sin x$	Evaluation
$=\sin x$	Algebra

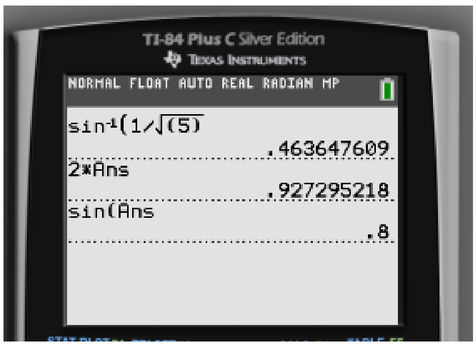
Find $\sin 2x$, $\cos 2x$, and $\tan 2x$ if $\sin x = \frac{1}{\sqrt{5}}$ and x terminates in quadrant II.

$\sin 2x = 2\sin x\cos x = 2\,(1/\sqrt{5})$

$\cos 2x = \cos^2(x) - \sin^2(x) = 4/5 - 1/5 = 3/5$

$\tan 2x = \dfrac{\sin(2x)}{\cos(2x)}$





$\sin x \, \cancel{\sec}\,\csc x$

$\sin x \dfrac{1}{\cos x}$ recip.

$\dfrac{\sin x}{\cos x}$ Alg

$\tan x$ Quotient

(1) $\sin(\cancel{u}+\cancel{v}) = \sin\cancel{u}\cos\cancel{v} + \cos\cancel{u}\sin\cancel{v}$

(2) $\sin(u-v) = \sin u\cos v - \cos u\sin v$

(3) $\cos(\cancel{u}+\cancel{v}) = \cos\cancel{u}\cos\cancel{v} - \sin\cancel{u}\sin\cancel{v}$

(4) $\cos(u-v) = \cos u\cos v + \sin u\sin v$

$\sin(2x) = \sin(x+x) = \sin x\cos x + \sin x\cos x$

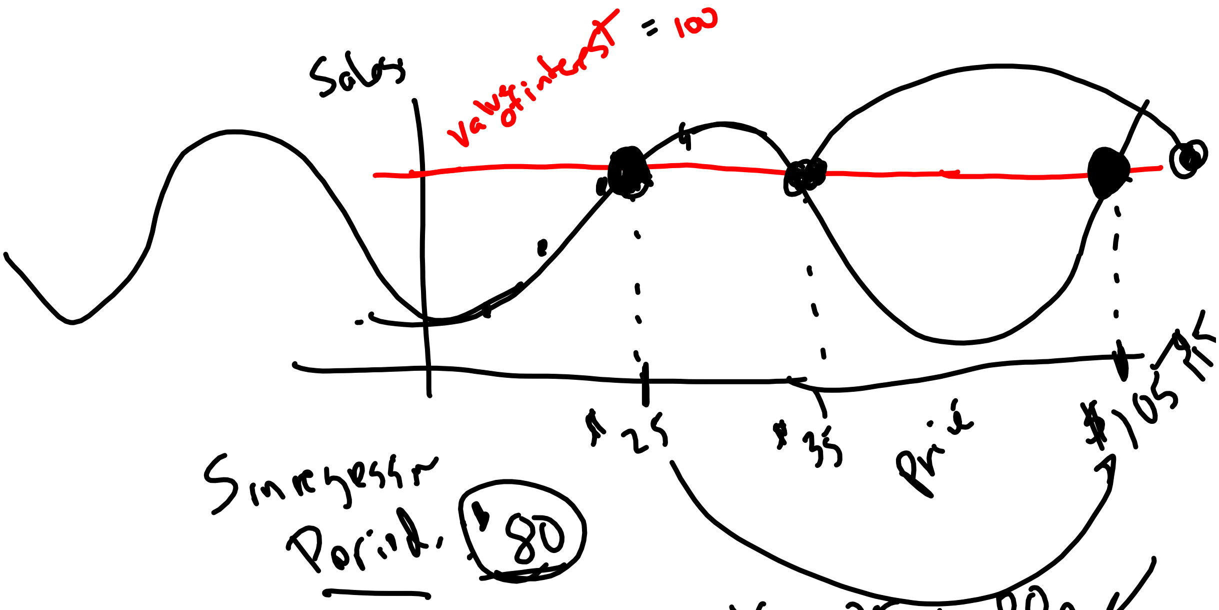
$= 2\sin x\cos x$

$\cos(2x) = \cos x\cos x - \sin x\sin x$

$= \cos^2 x - \sin^2 x$

$\cos(2x) \Leftarrow 1 - \sin^2 x - \sin^2 x = 1 - 2\sin^2 x$

Project- Many solutions



Sin regression Period. $80

$X = 25 + 80n$

$X = 35 + 80n$

To sell 100 items we charge $25, $35 and multiples of $80 more. Accurate to sine regression