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....

Reciprocol Identities

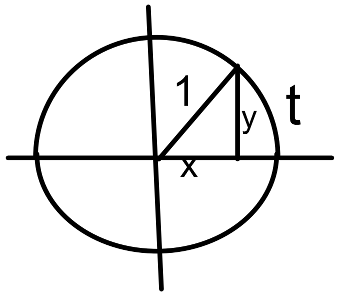
sin(t)=y	1/y= 1/sin(t) = csc(t)
cos(t)=x	1/x= 1/cos(t) = sec(t)
tan(t)=y/x	x/y= 1/tan(t) = cot(t)
	1/csc(t) = sin(t)
	1/sec(t) = cos(t)
	1/cot(t) = tan(t)

Quotient Identies

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

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

Pythagorean Identities



$x^2+y^2=1$

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

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

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

Simplifying trigonometric expressions

Simplify.

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

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

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

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

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

Verifying a trigonometric identity

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

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

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

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

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

cscx cscx sin x sec x algebra

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

cscx secx algebra

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

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.

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

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

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

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

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

sum and difference identities

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

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

$$\sin(\overset{x+x}{\alpha+\beta})=\sin\overset{x}{\alpha}\cos\overset{x}{\beta}+\cos\overset{x}{\alpha}\sin\overset{x}{\beta}$$
$$\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$$
$$\cos(\overset{x+x}{\alpha+\beta})=\cos\overset{x}{\alpha}\cos\overset{x}{\beta}-\sin\overset{x}{\alpha}\sin\overset{x}{\beta}$$
$$\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$$
$$\tan(\alpha+\beta)=\frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$$
$$\tan(\alpha-\beta)=\frac{\tan\alpha-\tan\beta}{1+\tan\alpha\tan\beta}$$

$\cos(2x)=$

$\cos^2x+\sin^2x$

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