1. Prove the following trig identities.

a) $\sin 2x = \frac{2\tan x}{1+\tan^2 x}$

b) $\frac{\sin t}{1+\cos t} = \frac{1-\cos t}{\sin t}$

c) $\cos 2x = \frac{2-\sec^2 x}{\sec^2 x}$

d) $\frac{\sin(x+y)}{\cos(x-y)} = \frac{\cot x+\cot y}{1+\cot x \cot y}$

2. Use the addition formula $\tan(u+v) = \frac{\tan u+\tan v}{1-\tan u \tan v}$ to derive the following identity for the average rate of change of the tangent function:

$$\frac{\tan(x+h)-\tan x}{h} = \frac{1}{\cos^2 x}\left(\frac{\sin h}{h}\right)\frac{1}{\cos h - \sin h \tan x}$$

HOMEWORK

Prove the following trig identities.

a) $\csc\theta \cos^2\theta + \sin\theta = \csc\theta$

b) $\frac{\sin x+\tan x}{1+\cos x} = \tan x$

c) $\frac{\sin x}{1+\cos x} + \frac{1+\cos x}{\sin x} = 2\csc x$

d) $2\cos^3 x - \cos x = \frac{\cos^2 x-\sin^2 x}{\sec x}$

e) $\frac{\tan^2 t+1}{\tan t \csc^2 t} = \tan t$