

Precalculus

Homework Lecture 4

1. Prove the trigonometry identities.

(a) $\sin \theta \cot \theta = \cos \theta$.

(b) $(\sin \theta + \cos \theta)^2 = 1 + \sin(2\theta)$.

(c) $\sec \theta - \cos \theta = \tan \theta \sin \theta$.

(d) $\tan^2 \theta - \sin^2 \theta = \tan^2 \theta \sin^2 \theta$.

(e) $\cot^2 \theta + \sec^2 \theta = \tan^2 \theta + \csc^2 \theta$.

(f) $2 \csc(2\theta) = \sec \theta \csc \theta$.

(g) $\tan(2\theta) = \frac{2 \tan \theta}{1 - \tan^2 \theta}$.

(h) $\frac{1}{1 - \sin \theta} + \frac{1}{1 + \sin \theta} = 2 \sec^2 \theta$.

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

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

(k) $\sin(3\theta) + \sin \theta = 2 \sin(2\theta) \cos \theta$.

(l) $\cos(3\theta) = 4 \cos^3 \theta - 3 \cos \theta$.

(m) $1 + \tan^2 \theta = \sec^2 \theta$.

(n) $1 + \csc^2 \theta = \cot^2 \theta$.

(o) $2 \cos^2(2x) = 2 \sin^4 \theta + 2 \cos^4 \theta - \sin^2(2\theta)$.

(p) $\frac{1 + \tan\left(\frac{\theta}{2}\right)}{1 - \tan\left(\frac{\theta}{2}\right)} = \tan \theta + \sec \theta$.