# Trig Identities DAY 2

Prove the following identities:

1. $\frac{1}{1-cos\theta} + \frac{1}{1+cos\theta} = \frac{2}{sin^2\theta}$

$LS = \frac{1}{1-\cos\theta} + \frac{1}{1+\cos\theta}$

$= \frac{1+\cos\theta}{(1-\cos\theta)(1+\cos\theta)} + \frac{1-\cos\theta}{(1-\cos\theta)(1+\cos\theta)}$

$= \frac{2}{(1-\cos\theta)(1+\cos\theta)}$

$= \frac{2}{1+\cos\theta-\cos\theta-\cos^2\theta}$

$= \frac{2}{1-\cos^2\theta}$

$RS = \frac{2}{\sin^2\theta}$

$= \frac{2}{1-\cos^2\theta}$

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

$LS = (\sin\theta + \cos\theta)(\sin\theta - \cos\theta)$

$= \sin^2\theta - \sin\theta\cos\theta + \sin\theta\cos\theta - \cos^2\theta$

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

$= 1-\cos^2\theta - \cos^2\theta$

$= 1 - 2\cos^2\theta$

$RS = 1-2\cos^2\theta$

3. $sin^2\theta - sin^4\theta = cos^2\theta - cos^4\theta$

$$LS = \sin^2\theta - \sin^4\theta$$
$$= \sin^2\theta - (\sin^2\theta)(\sin^2\theta)$$
$$= 1-\cos^2\theta - (1-\cos^2\theta)(1-\cos^2\theta)$$
$$= 1-\cos^2\theta - (1-\cos^2\theta-\cos^2\theta+\cos^4\theta)$$
$$= 1-\cos^2\theta - (1-2\cos^2\theta+\cos^4\theta)$$
$$= 1-\cos^2\theta - 1 + 2\cos^2\theta - \cos^4\theta$$
$$= \cos^2\theta - \cos^4\theta$$

$$LS = \sin^2\theta - \sin^4\theta$$
$$= \sin^2\theta(1-\sin^2\theta)$$
$$= \sin^2\theta\cos^2\theta$$

$$RS = \cos^2\theta - \cos^4\theta$$
$$= \cos^2\theta(1-\cos^2\theta)$$
$$= \cos^2\theta\sin^2\theta$$

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