

Level 1 Quotient & Reciprocal Identities

$$\sin\theta = \cos\theta \tan\theta$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

$$\tan\theta = \sin\theta \sec\theta$$

$$\cos\theta = \frac{\cot\theta}{\csc\theta}$$

$$\cot\theta \sin\theta = \cos\theta$$

$$\csc\theta = \frac{\cot\theta}{\cos\theta}$$

$$\csc\theta = \cot\theta \sec\theta$$

$$\sec\theta = \frac{\tan\theta}{\sin\theta}$$

$$\sin\theta = \cos\theta \tan\theta$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

$$\tan\theta = \sin\theta \sec\theta$$

$$\cos\theta = \frac{\cot\theta}{\csc\theta}$$

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$$\csc\theta = \cot\theta \sec\theta$$

$$\sec\theta = \frac{\tan\theta}{\sin\theta}$$

$$\sin\theta = \cos\theta \tan\theta$$

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$$\cot\theta \sin\theta = \cos\theta$$

$$\csc\theta = \frac{\cot\theta}{\cos\theta}$$

$$\csc\theta = \cot\theta \sec\theta$$

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$$\sin\theta = \cos\theta \tan\theta$$

$$\cot\theta = \frac{\cos\theta}{\sin\theta}$$

$$\tan\theta = \sin\theta \sec\theta$$

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$$\cot\theta \sin\theta = \cos\theta$$

$$\csc\theta = \frac{\cot\theta}{\cos\theta}$$

$$\csc\theta = \cot\theta \sec\theta$$

$$\sec\theta = \frac{\tan\theta}{\sin\theta}$$

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$$\cos\theta = \frac{\cot\theta}{\csc\theta}$$

$$\cot\theta \sin\theta = \cos\theta$$

$$\csc\theta = \frac{\cot\theta}{\cos\theta}$$

$$\csc\theta = \cot\theta \sec\theta$$

$$\sec\theta = \frac{\tan\theta}{\sin\theta}$$

Level 2 Pythagorean Identity

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

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

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

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

$$2\sin^2\theta + \cos^4\theta - 1$$

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

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

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

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

$$2\sin^2\theta + \cos^4\theta - 1$$

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

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

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

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

$$2\sin^2\theta + \cos^4\theta - 1$$

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

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

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

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

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

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

$$\frac{\cos\theta}{\sec\theta} + \frac{\sin\theta}{\csc\theta} = 1$$

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

$$\frac{1 + \sin \theta}{\cos \theta} = \sec \theta + \tan \theta$$

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

$$\frac{1}{\sec^2 \theta} + \frac{1}{\csc^2 \theta} = 1$$

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

$$\frac{1 + \cos \theta}{\sin \theta} = \csc \theta + \cot \theta$$

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

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

$$\frac{1 + \sin \theta}{\cos \theta} = \sec \theta + \tan \theta$$

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

$$\frac{1}{\sec^2 \theta} + \frac{1}{\csc^2 \theta} = 1$$

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

$$\frac{1 + \cos \theta}{\sin \theta} = \csc \theta + \cot \theta$$

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

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

$$\frac{1 + \sin \theta}{\cos \theta} = \sec \theta + \tan \theta$$

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

$$\frac{1}{\sec^2 \theta} + \frac{1}{\csc^2 \theta} = 1$$

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

$$\frac{1 + \cos \theta}{\sin \theta} = \csc \theta + \cot \theta$$

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

Level 5 Create Your Own

Create three of your own trigonometric identities. To solve it, you must use at least two of the following identities:

$$\sin^2\theta + \cos^2\theta = 1$$

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

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

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

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

Create three of your own trigonometric identities. To solve it, you must use at least two of the following identities:

$$\sin^2\theta + \cos^2\theta = 1$$

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

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

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

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

Create three of your own trigonometric identities. To solve it, you must use at least two of the following identities:

$$\sin^2\theta + \cos^2\theta = 1$$

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

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

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

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Create three of your own trigonometric identities. To solve it, you must use at least two of the following identities:

$$\sin^2\theta + \cos^2\theta = 1$$

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

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

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

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

Create three of your own trigonometric identities. To solve it, you must use at least two of the following identities:

$$\sin^2\theta + \cos^2\theta = 1$$

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

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

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

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

Create three of your own trigonometric identities. To solve it, you must use at least two of the following identities:

$$\sin^2\theta + \cos^2\theta = 1$$

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

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

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

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

Level 1 Quotient & Reciprocal Identities Solutions

$\sin\theta = \cos\theta \tan\theta$ $RS = \cos\theta \left(\frac{\sin\theta}{\cos\theta} \right)$ $RS = \sin\theta = LS$ $\cot\theta = \frac{\cos\theta}{\sin\theta}$ $LS = \frac{1}{\tan\theta}$ $LS = \frac{1}{\frac{\sin\theta}{\cos\theta}}$ $LS = 1 \times \frac{\sin\theta}{\cos\theta}$ $LS = \frac{\sin\theta}{\cos\theta} = RS$ $\tan\theta = \sin\theta \sec\theta$ $RS = \sin\theta \frac{1}{\cos\theta}$ $RS = \frac{\sin\theta}{\cos\theta}$ $RS = \tan\theta = LS$ $\cos\theta = \frac{\cot\theta}{\csc\theta}$ $RS = \frac{\frac{1}{\tan\theta}}{\frac{1}{\sin\theta}}$ $RS = \frac{1}{\tan\theta} \times \frac{\sin\theta}{1}$ $RS = \frac{1}{\frac{\sin\theta}{\cos\theta}} \times \sin\theta$ $RS = 1 \times \frac{\cos\theta}{\sin\theta} \times \sin\theta$ $RS = \cos\theta$	$\cot\theta \sin\theta = \cos\theta$ $LS = \cot\theta \sin\theta$ $LS = \frac{1}{\tan\theta} \sin\theta$ $LS = \frac{1}{\frac{\sin\theta}{\cos\theta}} \sin\theta$ $LS = 1 \times \frac{\cos\theta}{\sin\theta} \sin\theta$ $LS = \cos\theta = RS$ $\csc\theta = \frac{\cot\theta}{\cos\theta}$ $LS = \csc\theta$ $LS = \frac{1}{\sin\theta}$ $RS = \frac{\cot\theta}{\cos\theta}$ $RS = \frac{\frac{\cos\theta}{\sin\theta}}{\cos\theta}$ $RS = \frac{\cos\theta}{\sin\theta} \times \frac{1}{\cos\theta}$ $RS = \frac{1}{\sin\theta} = LS$ $\csc\theta = \cot\theta \sec\theta$ $LS = \csc\theta$ $LS = \frac{1}{\sin\theta}$ $RS = \cot\theta \sec\theta$ $RS = \frac{\cos\theta}{\sin\theta} \times \frac{1}{\cos\theta}$ $RS = \frac{1}{\sin\theta} = LS$ $\sec\theta = \frac{\tan\theta}{\sin\theta}$ $LS = \sec\theta$ $LS = \frac{1}{\cos\theta}$ $RS = \frac{\tan\theta}{\sin\theta}$ $RS = \frac{\frac{\sin\theta}{\cos\theta}}{\sin\theta}$ $RS = \frac{\sin\theta}{\cos\theta} \times \frac{1}{\sin\theta}$ $RS = \frac{1}{\cos\theta} = LS$
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Level 2 Pythagorean Identity

$\sin^2\theta + \sin^2\theta + \cos^2\theta + \cos^2\theta = 2$ $LS = \sin^2\theta + \sin^2\theta + \cos^2\theta + \cos^2\theta$ $LS = \sin^2\theta + \cos^2\theta + \sin^2\theta + \cos^2\theta$ $LS = 1 + 1 = 2 = RS$ $\sin\theta - \sin\theta \cos^2\theta = \sin^3\theta$ $LS = \sin\theta - \sin\theta \cos^2\theta$ $LS = \sin\theta(1 - \cos^2\theta)$ $LS = \sin\theta(\sin^2\theta)$	$-\cos^2\theta = (\sin\theta - 1)(\sin\theta + 1)$ $LS = -\cos^2\theta$ $LS = -(1 - \sin^2\theta)$ $LS = -1 + \sin^2\theta$ $LS = \sin^2\theta - 1 = RS$ $RS = (\sin\theta - 1)(\sin\theta + 1)$ $RS = \sin^2\theta + \sin\theta - \sin\theta - 1$ $RS = \sin^2\theta - 1$ $(\sin\theta + \cos\theta)^2 = 1 + 2\sin\theta\cos\theta$ $LS = (\sin\theta + \cos\theta)^2$ $LS = (\sin\theta + \cos\theta)(\sin\theta + \cos\theta)$
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$LS = \sin^3 \theta = RS$ $(1 - \cos \theta)(1 + \cos \theta) = \sin^2 \theta$ $LS = (1 - \cos \theta)(1 + \cos \theta)$ $LS = 1 + \cos \theta - \cos \theta - \cos^2 \theta$ $LS = 1 - \cos^2 \theta$ $LS = \sin^2 \theta = RS$ $(1 - \cos^2 \theta)(1 - \cos^2 \theta) =$ $2\sin^2 \theta + \cos^4 \theta - 1$ $LS = (1 - \cos^2 \theta)(1 - \cos^2 \theta)$ $LS = 1 - \cos^2 \theta - \cos^2 \theta + \cos^4 \theta$ $LS = 1 - 2\cos^2 \theta + \cos^4 \theta$ $LS = 1 - 2(1 - \sin^2 \theta) + \cos^4 \theta$ $LS = 1 - 2 + 2\sin^2 \theta + \cos^4 \theta$ $LS = -1 + 2\sin^2 \theta + \cos^4 \theta$ $LS = 2\sin^2 \theta + \cos^4 \theta - 1 = RS$	$LS = \sin^2 \theta + \sin \theta \cos \theta + \cos \theta \sin \theta + \cos^2 \theta$ $LS = \sin^2 \theta + 2\sin \theta \cos \theta + \cos^2 \theta$ $LS = \sin^2 \theta + \cos^2 \theta + 2\sin \theta \cos \theta$ $LS = 1 + 2\sin \theta \cos \theta = RS$ $(1 - \sin^2 \theta)\cos^2 \theta =$ $2\cos^2 \theta + \sin^4 \theta - 1$ $LS = (1 - \sin^2 \theta)\cos^2 \theta$ $LS = \cos^2 \theta - \sin^2 \theta \cos^2 \theta$ $LS = \cos^2 \theta - \sin^2 \theta(1 - \sin^2 \theta)$ $LS = \cos^2 \theta - \sin^2 \theta + \sin^4 \theta$ $LS = \cos^2 \theta - (1 - \cos^2 \theta) + \sin^4 \theta$ $LS = \cos^2 \theta - 1 + \cos^2 \theta + \sin^4 \theta$ $LS = 2\cos^2 \theta + \sin^4 \theta - 1 = RS$ $\cos \theta - \cos \theta \sin^2 \theta = \cos^3 \theta$ $LS = \cos \theta - \cos \theta \sin^2 \theta$ $LS = \cos \theta - \cos \theta(1 - \cos^2 \theta)$ $LS = \cos \theta - \cos \theta + \cos^3 \theta$ $LS = \cos^3 \theta = RS$
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Level 3 Mixed Identities 1

$\frac{\cos \theta}{\sec \theta} + \frac{\sin \theta}{\csc \theta} = 1$ $LS = \frac{\cos \theta}{\frac{1}{\cos \theta}} + \frac{\sin \theta}{\frac{1}{\sin \theta}}$ $LS = \cos \theta \times \frac{\cos \theta}{1} + \sin \theta \times \frac{\sin \theta}{1}$ $LS = \cos^2 \theta + \sin^2 \theta$ $LS = 1 = RS$ $(1 - \cos^2 \theta)\csc \theta = \sin \theta$ $LS = (1 - \cos^2 \theta)\csc \theta$ $LS = \sin^2 \theta \times \frac{1}{\sin \theta}$ $LS = \sin \theta = RS$ $\frac{1 + \sin \theta}{\cos \theta} = \sec \theta + \tan \theta$ $RS = \sec \theta + \tan \theta$ $RS = \frac{1}{\cos \theta} + \frac{\sin \theta}{\cos \theta}$ $RS = \frac{1 + \sin \theta}{\cos \theta} = LS$ $(1 - \sin^2 \theta)\csc \theta = \cos \theta \cot \theta$ $LS = (1 - \sin^2 \theta)\csc \theta$	$\frac{1}{\sec^2 \theta} + \frac{1}{\csc^2 \theta} = 1$ $LS = \frac{1}{\sec^2 \theta} + \frac{1}{\csc^2 \theta}$ $LS = \frac{1}{\frac{1}{\cos^2 \theta}} + \frac{1}{\frac{1}{\sin^2 \theta}}$ $LS = 1 \times \frac{\cos^2 \theta}{1} + 1 \times \frac{\sin^2 \theta}{1}$ $LS = \cos^2 \theta + \sin^2 \theta$ $LS = \sin^2 \theta + \cos^2 \theta$ $LS = 1 = RS$ $(1 - \sin^2 \theta)\sec \theta = \cos \theta$ $LS = (1 - \sin^2 \theta)\sec \theta$ $LS = \cos^2 \theta \times \frac{1}{\cos \theta}$ $LS = \cos \theta = RS$ $\frac{1 + \cos \theta}{\sin \theta} = \csc \theta + \cot \theta$ $LS = \frac{1 + \cos \theta}{\sin \theta}$ $LS = \frac{1}{\sin \theta} + \frac{\cos \theta}{\sin \theta}$ $LS = \csc \theta + \cot \theta = RS$
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$LS = \cos^2 \theta \csc \theta$ $LS = \cos^2 \theta \times \frac{1}{\sin \theta}$ $LS = \cos \theta \times \cos \theta \times \frac{1}{\sin \theta}$ $LS = \cos \theta \times \frac{\cos \theta}{\sin \theta}$ $LS = \cos \theta \cot \theta = RS$	$(1 - \cos^2 \theta) \sec \theta = \sin \theta \tan \theta$ $LS = (1 - \cos^2 \theta) \sec \theta$ $LS = \sin^2 \theta \times \sec \theta$ $LS = \sin \theta \times \sin \theta \times \frac{1}{\cos \theta}$ $LS = \sin \theta \times \frac{\sin \theta}{\cos \theta}$ $LS = \sin \theta \tan \theta = RS$
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Level 4 Mixed Identities 2

$(\sin \theta + \cos \theta)^2 + (\sin \theta - \cos \theta)^2 = 2$ $LS = (\sin \theta + \cos \theta)^2 + (\sin \theta - \cos \theta)^2$ $LS = (\sin \theta + \cos \theta)(\sin \theta + \cos \theta) + (\sin \theta - \cos \theta)(\sin \theta - \cos \theta)$ $LS = \sin^2 \theta + \sin \theta \cos \theta + \cos \theta \sin \theta + \cos^2 \theta + \sin^2 \theta - \sin \theta \cos \theta - \cos \theta \sin \theta$ $LS = \sin^2 \theta + \cos^2 \theta + \sin^2 \theta + \cos^2 \theta$ $LS = 1 + 1$ $LS = 2 = RS$ $\frac{(1 - \sin^2 \theta)(1 + \sin^2 \theta)}{\sin^2 \theta} = \csc^2 \theta - \sin^2 \theta$ $LS = \frac{(1 - \sin^2 \theta)(1 + \sin^2 \theta)}{\sin^2 \theta}$ $LS = \frac{1 + \sin^2 \theta - \sin^2 \theta - \sin^4 \theta}{\sin^2 \theta}$ $LS = \frac{1 - \sin^4 \theta}{\sin^2 \theta}$ $LS = \frac{1}{\sin^2 \theta} - \frac{\sin^4 \theta}{\sin^2 \theta}$ $LS = \csc^2 \theta - \sin^2 \theta = RS$ $\frac{\cos \theta}{\sin \theta + 1} = \sec \theta - \tan \theta$ $LS = \frac{\cos \theta}{\sin \theta + 1}$ $LS = \frac{\cos \theta}{(\sin \theta + 1)} \times \frac{(\sin \theta - 1)}{(\sin \theta - 1)}$ $LS = \frac{\cos \theta \sin \theta - \cos \theta}{\sin^2 \theta - \sin \theta + \sin \theta - 1}$ $LS = \frac{\cos \theta \sin \theta - \cos \theta}{\sin^2 \theta - 1}$ $LS = \frac{\cos \theta \sin \theta - \cos \theta}{-(1 - \sin^2 \theta)}$ $LS = \frac{\cos \theta \sin \theta - \cos \theta}{-\cos^2 \theta}$ $LS = \frac{\cos \theta \sin \theta}{-\cos^2 \theta} + \frac{-\cos \theta}{-\cos^2 \theta}$ $LS = -\frac{\sin \theta}{\cos \theta} + \frac{1}{\cos \theta}$ $LS = -\tan \theta + \sec \theta = \sec \theta - \tan \theta = RS$ $\frac{\cos \theta \tan \theta}{\sin \theta + \cos \theta} = \frac{\tan \theta}{1 + \tan \theta}$	$\frac{2}{\cos^2 \theta} = \frac{1}{1 + \sin \theta} + \frac{1}{1 - \sin \theta}$ $RS = \frac{1}{1 + \sin \theta} + \frac{1}{1 - \sin \theta}$ $RS = \frac{1}{(1 + \sin \theta)} \times \frac{(1 - \sin \theta)}{(1 - \sin \theta)} + \frac{1}{(1 - \sin \theta)} \times \frac{(1 + \sin \theta)}{(1 + \sin \theta)}$ $RS = \frac{1 - \sin \theta}{1 - \sin \theta + \sin \theta - \sin^2 \theta} + \frac{1 + \sin \theta}{1 + \sin \theta - \sin \theta - \sin^2 \theta}$ $RS = \frac{1 - \sin \theta}{1 - \sin^2 \theta} + \frac{1 + \sin \theta}{1 - \sin^2 \theta}$ $RS = \frac{1 - \sin \theta + 1 + \sin \theta}{1 - \sin^2 \theta}$ $RS = \frac{1 + 1}{\cos^2 \theta} = \frac{2}{\cos^2 \theta} = LS$ $\frac{1 - \sin^4 \theta}{\cos^2 \theta} = 2 - \cos^2 \theta$ $LS = \frac{1 - \sin^4 \theta}{\cos^2 \theta}$ $LS = \frac{(1 - \sin^2 \theta)(1 + \sin^2 \theta)}{\cos^2 \theta}$ $LS = \frac{\cos^2 \theta (1 + \sin^2 \theta)}{\cos^2 \theta}$ $LS = 1 + \sin^2 \theta$ $LS = 1 + (1 - \cos^2 \theta) = 2 - \cos^2 \theta = RS$ $\tan^2 \theta + \cos^2 \theta + \sin^2 \theta = \sec^2 \theta$ $LS = \tan^2 \theta + \cos^2 \theta + \sin^2 \theta$ $LS = \tan^2 \theta + \sin^2 \theta + \cos^2 \theta$ $LS = \frac{\sin^2 \theta}{\cos^2 \theta} + 1$ $LS = \frac{\sin^2 \theta}{\cos^2 \theta} + \frac{\cos^2 \theta}{\cos^2 \theta}$ $LS = \frac{\sin^2 \theta + \cos^2 \theta}{\cos^2 \theta}$ $LS = \frac{1}{\cos^2 \theta} = \sec^2 \theta = RS$
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$$LS = \frac{\cos\theta \tan\theta}{\sin\theta + \cos\theta}$$

$$LS = \frac{\cos\theta \tan\theta}{\sin\theta + \cos\theta} \times \frac{\frac{1}{\cos\theta}}{\frac{1}{\cos\theta}}$$

$$LS = \frac{\cos\theta \tan\theta \times \frac{1}{\cos\theta}}{(\sin\theta + \cos\theta) \times \frac{1}{\cos\theta}}$$

$$LS = \frac{\tan\theta}{\frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\cos\theta}}$$

$$LS = \frac{\tan\theta}{\tan\theta + 1} = \frac{\tan\theta}{1 + \tan\theta} = RS$$

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

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

$$LS = \frac{\cos^2\theta}{(1 - \sin\theta)} \times \frac{(1 + \sin\theta)}{(1 + \sin\theta)}$$

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

$$LS = \frac{\cos^2\theta + \cos^2\theta \sin\theta}{\cos^2\theta + \cos^2\theta \sin\theta}$$

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

$$LS = 1 + \sin\theta = RS$$