TWO COLUMN PROOFS OF TRIG IDENTITIES

Listed below are proofs of trigonometric identities. It is your job to determine the theorem, property, or identity used in each step. (Think of this as a two-column proof similar to the ones you LOVED to do in Geometry.) Not all steps will have trig reasons.

Proof	Reason
$\sin x + \cos x = \frac{\cot x + 1}{\csc x}$	Given
$= (\cot x + 1) + \csc x$	Division
$= (\cot x + 1) \cdot \frac{1}{\csc x}$	mult by reciprocal
$= (\cot x + 1) \cdot \sin x$	rewrite
$= \cot x \sin x + \sin x$	distribute
$= \frac{\cos x}{\sin x} \sin x + \sin x$	rewrite
$= \cos x + \sin x$	simplify

2.

Proof	Reason
$\frac{1}{\sec x - \tan x} = \sec x + \tan x$	Given
$\frac{1}{\sec x - \tan x} \cdot \frac{\sec x + \tan x}{\sec x + \tan x} =$	mult by conjugate
$\frac{\sec x + \tan x}{\sec^2 x - \tan^2 x} =$	multiply
$\frac{\sec x + \tan x}{1 + \tan^2 x - \tan^2 x} =$	Pythagorean ID
$\sec x + \tan x =$	Simplify

3.

Proof	Reason
$\frac{\sec^2 x - 1}{\sec^2 x} = \sin^2 x$	Given
$\frac{\sec^2 x}{\sec^2 x} - \frac{1}{\sec^2 x} =$	split fraction
$1 - \frac{1}{\sec^2 x} =$	simplify
$1 - \cos^2 x =$	rewrite
$\sin^2 x + \cos^2 x - \cos^2 x =$	Pythagorean ID
$\sin^2 x =$	simplify

Proof	Reason
$2\sec x = \frac{1+\sin x}{\cos x} + \frac{\cos x}{1+\sin x}$	Given
$= \frac{(1+\sin x)^2}{\cos x(1+\sin x)} + \frac{\cos^2 x}{\cos x(1+\sin x)}$	Common denominators
$= \frac{1+2\sin x+\sin^2 x}{\cos x(1+\sin x)} + \frac{\cos^2 x}{\cos x(1+\sin x)}$	multiply
$= \frac{1+2\sin x+\sin^2 x+\cos^2 x}{\cos x(1+\sin x)}$	add fractions
$= \frac{1+2\sin x+1}{\cos x(1+\sin x)}$	Pythagorean ID
$= \frac{2+2\sin x}{\cos x(1+\sin x)}$	combine like terms
$= \frac{2(1+\sin x)}{\cos x(1+\sin x)}$	GCF
$= \frac{2}{\cos x}$	simplify
$= 2 \cdot \frac{1}{\cos x}$	rewrite
$= 2\sec x$	rewrite