$\csc^2(x)\left(1-\cos^2(x)\right)=1$

$\csc^2(x)\ \sin^2(x) =$ Pythagorean ID

$\frac{1}{\sin^2(x)}\ \sin^2(x) =$ Reciprocal ID

$1 =$ cancel

$(\sec(\alpha)+\tan(\alpha))(\csc(\alpha)-1)=\cot(\alpha)$

$\left(\frac{1}{\cos(\alpha)}+\frac{\sin(\alpha)}{\cos(\alpha)}\right)\left(\frac{1}{\sin(\alpha)}-1\right) =$ Quotient ID, Reciprocal ID

$\left(\frac{1+\sin(\alpha)}{\cos(\alpha)}\right)\left(\frac{1-\sin(\alpha)}{\sin(\alpha)}\right) =$ common Denominators

$\frac{1-\sin^2(\alpha)}{\cos(\alpha)\sin(\alpha)} =$ FOIL, multiply

$\frac{\cos^2(\alpha)}{\cos(\alpha)\sin(\alpha)} =$ Pythagorean ID

$\frac{\cos(\alpha)}{\sin(\alpha)} =$ cancel

$\cot(\alpha) =$ Quotient ID

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

$\frac{(1+\sin(\theta))}{(1+\sin(\theta))}\frac{(1-\sin(\theta))}{\cos(\theta)} =$ Conjugate, Multiply by 1

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

$\frac{\cos^2(\theta)}{(1+\sin(\theta))\cos(\theta)} =$ Pythagorean ID

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

$\csc^2(x)\left(1-\cos^2(x)\right)=1$

$\csc^2(x)\ \sin^2(x) =$ Pythagorean ID

$\frac{1}{\sin^2(x)}\ \sin^2(x) =$ Reciprocal ID

$1 =$ cancel

$(\sec(\alpha)+\tan(\alpha))(\csc(\alpha)-1) = \cot(\alpha)$

$\left(\frac{1}{\cos(\alpha)}+\frac{\sin(\alpha)}{\cos(\alpha)}\right)\left(\frac{1}{\sin(\alpha)}-1\right) =$ Quotient ID, Reciprocal ID

$\left(\frac{1+\sin(\alpha)}{\cos(\alpha)}\right)\left(\frac{1-\sin(\alpha)}{\sin(\alpha)}\right) =$ common Denominators

$\frac{1-\sin^2(\alpha)}{\cos(\alpha)\sin(\alpha)} =$ FOIL, Multiply

$\frac{\cos^2(\alpha)}{\cos(\alpha)\sin(\alpha)} =$ Pythagorean ID

$\frac{\cos(\alpha)}{\sin(\alpha)} =$ cancel

$\cot(\alpha) =$ Quotient ID

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

$\frac{(1+\sin(\theta))}{(1+\sin(\theta))}\frac{(1-\sin(\theta))}{\cos(\theta)} =$ conjugate, Multiply by 1

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

$\frac{\cos^2(\theta)}{(1+\sin(\theta))\cos(\theta)} =$ Pythagorean ID

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

$$\frac{\cos(x)}{1-\sin(x)} - \tan(x) = \sec(x)$$

$$\frac{\cos(x)}{1-\sin(x)} - \frac{\sin(x)}{\cos(x)} =$$ Quotient ID

$$\frac{\cos^2(x) - \sin(x)(1-\sin(x))}{\cos(x)(1-\sin(x))} =$$ common Denominators

$$\frac{\cos^2(x) - \sin(x) + \sin^2(x)}{\cos(x)(1-\sin(x))} =$$ Distribute

$$\frac{1-\sin(x)}{\cos(x)(1-\sin(x))} =$$ Pythagorean ID

$$\frac{1}{\cos(x)} =$$ cancel

$$\sec(x) =$$ Reciprocal ID

$$\frac{\cot\left(\frac{\pi}{2}-\theta\right) + \tan\left(\theta-\frac{\pi}{2}\right)}{\tan(-\theta)+\cot(-\theta)} = 2\cos^2(\theta)-1$$

$$\tan(\theta) - \cot(\theta) = \tan\left(-\left(\frac{\pi}{2}-\theta\right)\right)$$

$$\frac{\tan(\theta)-\cot(\theta)}{-\tan(\theta)-\cot(\theta)} =$$ cofunction odd/even ID

$$\frac{\frac{\sin(\theta)}{\cos(\theta)} \cdot \frac{\cos(\theta)}{\sin(\theta)}}{-\frac{\sin(\theta)}{\cos(\theta)} - \frac{\cos(\theta)}{\sin(\theta)}} =$$ Quotient ID

$$\frac{\frac{\sin^2(\theta)-\cos^2(\theta)}{\sin(\theta)\cos(\theta)}}{\frac{-\sin^2(\theta)-\cos^2(\theta)}{\sin(\theta)\cos(\theta)}} =$$ common Denominators

$$\frac{\sin^2(\theta)-\cos^2(\theta)}{\sin(\theta)\cos(\theta)} \cdot \frac{\cos(\theta)\sin(\theta)}{-(\sin^2(\theta)+\cos^2(\theta))} =$$ Divide Fractions Factor cancel

$$\frac{\sin^2(\theta)-\cos^2(\theta)}{-1} =$$ Pythagorean ID

$$-(1-\cos^2(\theta)-\cos^2(\theta)) =$$ Pythagorean ID Mutiply negative

$$2\cos^2(\theta)-1 =$$ combine like terms Distribute

$\sin(x+y) + \sin(x-y) = 2\sin(x)\cos(y)$

$\sin(x)\cos(y) + \cos(x)\sin(y) + \sin(x)\cos(y) - \cos(x)\sin(y) =$ sum/difference ID

$2\sin(x)\cos(y) =$ cancel / combine like terms

$\frac{\cos(x)-\cos(y)}{\sin(x)+\sin(y)} + \frac{\sin(x)-\sin(y)}{\cos(x)+\cos(y)} = 0$

$\frac{(\cos(x)+\cos(y))(\cos(x)-\cos(y)) + (\sin(x)-\sin(y))(\sin(x)+\sin(y))}{(\sin(x)+\sin(y))(\cos(x)+\cos(y))} =$ common Denominators

$\frac{\cos^2(x)-\cos^2(y)+\sin^2(x)-\sin^2(y)}{(\sin(x)+\sin(y))(\cos(x)+\cos(y))} =$ FOIL

$\frac{\cos^2(x)+\sin^2(x)-(\cos^2(y)+\sin^2(y))}{(\sin(x)+\sin(y))(\cos(x)+\cos(y))} =$ Rewrite / Factor / Pythagorean ID

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

$0 =$ subtract

$\frac{\cos(x)+\sec(x)}{\sin(x)+\cos(x)} = \cot(x)+\tan(x)$

$\frac{\frac{1}{\sin(x)}+\frac{1}{\cos(x)}}{\sin(x)+\cos(x)} =$ Reciprocal ID

$\frac{\frac{\cos(x)+\sin(x)}{\sin(x)\cos(x)}}{\sin(x)+\cos(x)} =$ common Denominators

$\frac{\cos(x)+\sin(x)}{\cos(x)\sin(x)} \cdot \frac{1}{\sin(x)+\cos(x)} =$ Divide Fractions

$\frac{1}{\cos(x)\sin(x)} =$ cancel

$$\frac{\sin^2(x)+\cos^2(x)}{\sin(x)\cos(x)} =$$ Pythagorean ID

$$\frac{\sin^2(x)}{\sin(x)\cos(x)} + \frac{\cos^2(x)}{\sin(x)\cos(x)} =$$ split Fraction

$$\frac{\sin(x)}{\cos(x)} + \frac{\cos(x)}{\sin(x)} =$$ cancel

$$\tan(x) + \cot(x) =$$ Quotient ID