(1.) $\sin[(\pi/2) + t] = \cos t$ here is the problem

$\sin[(\pi/2) + t]$ start on the left side

$= \sin(\pi/2)\cos t + \cos(\pi/2)\sin t$ sum id for sine

$= (1)(\cos t) + (0)(\sin t)$ use the unit circle

$= \cos t$ multiply add

(2.) $\cos[(\pi/2) - x] = \sin x$ here is the problem

$\cos[(\pi/2) - x]$ start on the left side

$= \cos(\pi/2)\cos x + \sin(\pi/2)\sin x$ difference id for cos

$= (0)(\cos x) + (1)(\sin x)$ use the unit circle

$= \sin x$ multiply add

(3.) $\cos^4 x - \sin^4 x = \cos^2 x - \sin^2 x$ here is the problem

$\cos^4 x - \sin^4 x$ start on the left side

$= (\cos^2 x - \sin^2 x)(\cos^2 x + \sin^2 x)$ factor

$= (\cos^2 x - \sin^2 x)(1)$ pythagorean identity

$= \cos^2 x - \sin^2 x$ multiply by 1

(4.) $1 + \sin 2x = (\sin x + \cos x)^2$ here is the problem

$(\sin x + \cos x)^2$ start on the right side

$= \sin^2 x + 2\sin x \cos x + \cos^2 x$ square the binomial

$= 1 + \sin 2x$ pythagorean id & double angle id for sin

(5.) $\dfrac{\cos^3 x - \cos x + \sin x}{\cos x} = \tan x - \sin^2 x$

$\dfrac{\cos^3 x - \cos + \sin x}{\cos x}$ start on the left side

$= \cos^2 x - 1 + \tan x$ divide

$= (-\sin^2 x) + \tan x$ pythagorean identity

$= \tan x - \sin^2 x$ rearrange terms

(6.) $\tan t + \cot t = \csc t \sec t$ here is the problem

$\tan t + \cot t$ start on the left side

$= (\csc t)(\sec t)(\sin^2 t + \cos^2 t)$ factor like this

$= (\csc t \sec t)(1)$ pythagorean identity

$= \csc t \sec t$ multiply

(7.) $\dfrac{1}{\sec A - \tan A} = \sec A + \tan A$

$\dfrac{1}{\sec A - \tan A}$ start on the left side

$= \dfrac{\cos A}{1 - \sin A}$ multiply thru by cos A, cancel

$= \dfrac{(\cos A)(1 + \sin A)}{(1 - \sin A)(1 + \sin A)}$ multiply by this form of 1

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

$$= \frac{\cos A + \sin A \cos x}{\cos^2 A}$$ pythagorean identity

$$= \sec A + \tan A$$ divide and cancel

(8.) $\frac{1 - \cos x}{\sin A} = \frac{\sin x}{1 + \cos x}$ here is the problem

$\frac{1 - \cos x}{\sin x}$ start on the left side

$$= \frac{(1 - \cos x)(1 + \cos x)}{(\sin x)(1 + \cos x)}$$ multiply by this form of 1

$$= \frac{1 - \cos^2 x}{(\sin x)(1 + \cos x)}$$ foil multiply combine like terms

$$= \frac{(\sin^2 x)}{(\sin x)(1 + \cos x)}$$ pythagorean identity

$$= \frac{\sin x}{1 + \cos x}$$ cancel

(9.) $\frac{\cos A}{\csc A - 1} + \frac{\cos A}{\csc A + 1}$ $2 \tan A$

$$\frac{\cos A}{\csc A - 1} + \frac{\cos A}{\csc A + 1}$$ start on the left side

$$\frac{(\cos A)(\csc A + 1) + (\cos A)(\csc A - 1)}{\csc^2 A - 1}$$ add fractions

$$= \frac{(\cos A)(2 \csc A)}{\cot^2 A}$$ factor and combine like terms; pythagorean identity

$$= \frac{(\cos^3 A)(2 \csc A)}{\sin^2 A}$$ multiply thru by $\cos^2 A$; cancel

$$= 2 \cot^3 A$$ simplify

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

$$\frac{1 - \sin x}{\cos x}$$ start on the left side

$$= \frac{(1 - \sin x)(1 + \sin x)}{(\cos x)(1 + \sin x)}$$ multiply by this form of 1

$$= \frac{1 - \sin^2 x}{(\cos x)(1 + \sin x)}$$ foil multiply combine like terms

$$= \frac{(\cos^2 x)}{(\cos x)(1 + \sin x)}$$ pythagorean id

= (cos x)/(1 + sin x) cancel

(11.) sin (45 + x) + sin (45 - x) = √2 cos x

sin (45 + x) + sin (45 - x) start on the left side

= sin 45 cos x + cos 45 sin x + sin 45 cos x - cos 45 sin x

= 2 sin 45 cos x combine like terms

= 2(√2/2)(cos x) use the unit circle

= √2 cos x cancel

(12.) $\frac{\cos 2A}{\cos A} = \frac{1 - \tan^2 A}{\sec A}$

$\frac{\cos 2A}{\cos A}$ start on the left side

= $\frac{\cos^2 A - \sin^2 A}{\cos A}$ double angle id for cos

= $\frac{1 - \tan^2 A}{\sec A}$ multiply thru by $\sec^2 A$, cancel

(13.) $\frac{\cos A}{1 - \sin A} = \frac{1 + \sin A}{\cos A}$

$$\frac{\cos A}{1 - \sin A}$$ start on the left side

$$= \frac{(\cos A)(1 + \sin A)}{(1 - \sin A)(1 + \sin A)}$$ multiply by this form of 1

$$= \frac{(\cos A)(1 + \sin A)}{1 - \sin^2 A}$$ foil multiply combine like terms

$$= \frac{(\cos A)(1 + \sin A)}{\cos^2 A}$$ pythagorean identity

$$= (1 + \sin A)/(\cos A)$$ cancel

(14.) $\sin^2 A + \tan^2 A = \sec^2 A - \cos^2 A$

$\sin^2 A + \tan^2 A$ start on the left side

$= 1 - \cos^2 A + \tan^2 A$ pythagorean identity

$= 1 + \tan^2 A - \cos^2 A$ rearrange terms

$= \sec^2 A - \cos^2 A$ pythagorean identity

(15.) $\frac{\sec x + 1}{\sec x - 1} = \cot^2 (x/2)$

$\cot^2 (x/2)$ start on the right side

$$= \frac{\cos^2 (x/2)}{\sin^2 (x/2)}$$ defintion of cot

$$= \frac{1 + \cos x}{1 - \cos x}$$ half angle id's for cos and sin

$$= \frac{\sec x + 1}{\sec x - 1}$$ multiply thru by sec x and cancel

(16.) $\tan [(\pi/4) + (A/2)] = \sec A + \tan A$

$\tan [(\pi/4) + (A/2)]$ start on the left side

$$= \frac{\tan (\pi/4) + \tan (A/2)}{1 - [\tan (\pi/4) \tan (A/2)}$$ use the sum id for tangent

$$= \frac{1 + \tan (A/2)}{1 - \tan (A/2)}$$ multiply by 1

$$= \frac{1 + 2 \tan (A/2) + \tan^2 (A/2)}{1 - \tan^2 (A/2)}$$ multiply top and bottom by $1 + \tan (A/2)$

$$= \frac{\cos^2 (A/2) + 2 \sin (A/2) \cos (A/2) + \sin^2 (A/2)}{\cos^2 (A/2) - \sin^2 (A/2)}$$

[multiply thru by $\cos^2 (A/2)$][and cancel]

$$= \frac{1 + \sin A}{\cos A}$$ simplify - - pythagorean id, double angle id's for sin and for cos

$= \sec A + \tan A$ divide thru by cos A