① $3\tan^2 x - 1 = 0$ $(-360, 720)$

$$\tan^2 x = \frac{1}{3}$$

$$\tan x = \pm\frac{1}{\sqrt{3}}$$

$\tan x = \frac{1}{\sqrt{3}}$

$x = \arctan\left(\frac{1}{\sqrt{3}}\right)$

$x = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right) + 180n$

$\tan x = -\frac{1}{\sqrt{3}}$

$x = \arctan\left(-\frac{1}{\sqrt{3}}\right)$

$x = \tan^{-1}\left(-\frac{1}{\sqrt{3}}\right) + 180n$

$$2\sin(3x) - 1 = 0$$

(2)

$$\sin(3x) = \frac{1}{2}$$

$$3x = \arcsin\left(\frac{1}{2}\right)$$

$$x = \frac{1}{3}\arcsin\left(\frac{1}{2}\right)$$

$$x = \frac{1}{3}\left[\sin^{-1}\left(\frac{1}{2}\right) + 360n\right]$$

$$x = \frac{1}{3}\sin^{-1}\left(\frac{1}{2}\right) + 120n$$

$$x = \frac{1}{3}\left[180 - \sin^{-1}\left(\frac{1}{2}\right) + 360n\right]$$

$$x = 60 - \frac{1}{3}\sin^{-1}\left(\frac{1}{2}\right) + 120n$$

(3) $\sec^2 x - 2\tan x = 4$

$1 + \tan^2 x - 2\tan x - 4 = 0$

$\tan^2 x - 2\tan x - 3 = 0$

$(\tan x - 3)(\tan x + 1) = 0$

$\tan x - 3 = 0$

$\tan x = 3$

$x = \tan^{-1}(3) + 180n$

$\tan x + 1 = 0$

$\tan x = -1$

$x = \tan^{-1}(-1) + 180n$

$/$

(4) Show $\cos^4 x - \sin^4 x = \cos^2 x - \sin^2 x$

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

$$(\cos^2 x - \sin^2 x) \quad 1$$

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

(5) Show $\dfrac{\sec^2\theta - \tan^2\theta}{2\sin^2\theta + 2\cos^2\theta} = \dfrac{1}{2}$

$$\frac{1 + \cancel{\tan^2\theta} - \cancel{\tan^2\theta}}{2(\sin^2\theta + \cos^2\theta)}$$

$$= \frac{1}{2(1)}$$

$$= \frac{1}{2}$$

$$\frac{1}{(1-\cos x)}\frac{(1+\cos x)}{(1+\cos x)} + \frac{1}{(1+\cos x)}\frac{(1-\cos x)}{(1-\cos x)} \qquad 2\csc^2 x$$

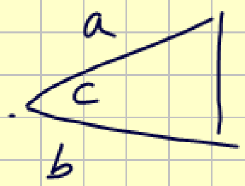
$$\frac{1+\cancel{\cos}\,x+1-\cancel{\cos}\,x}{1-\cos^2 x}$$

$$\frac{2}{\sin^2 x}$$

$$2\csc^2 x$$

Need:

1) $\vec{b} = |\vec{b}|\cos\theta\,\vec{i} + |\vec{b}|\sin\theta\,\vec{j}$

2. 

$A = \frac{1}{2} ab\sin C$

3. Law of sines $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

4. Law of cosines $c^2 = a^2 + b^2 - 2ab\cos C$

5. dot product $\vec{a}, \vec{b}$

$$\vec{a}\cdot\vec{b} = |\vec{a}||\vec{b}|\cos\theta$$

$$\vec{a}\cdot\vec{b} = a_x b_x + a_y b_y$$

① derive $\cos\left(\overset{A}{\theta} + \overset{B}{\frac{\pi}{2}}\right)$

$$\cos(A+B) = \cos A \cos B - \sin A \sin B$$

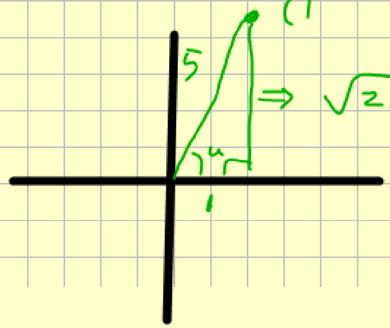
$$= \cos\theta\,[0] - \sin\theta\,[1]$$

$$\cos\left(\theta + \frac{\pi}{2}\right) = -\sin\theta$$

② $\cos u = \frac{1}{5}$ $\quad \sin v = \frac{1}{3}$

u, v are in 1^{st} quadrant

$$\sin 2u = 2\cos u \sin u$$



$\Rightarrow \sqrt{25-1} = \sqrt{24} = 2\sqrt{6}$

$$\sin u = \frac{2\sqrt{6}}{5}$$

$$\sin 2u = 2\left(\frac{1}{5}\right)\left(\frac{2\sqrt{6}}{5}\right)$$

$$= \frac{4\sqrt{6}}{25}$$

$\sin 2v$, $\cos 2v$, $\tan 2v$