Q.1 Find the I.V.P.

$(2y+\tan x)dy+(y\sec^2 x+\sec x\tan x)dx=0$

with $y(\frac{\pi}{4})=1$

Sol:// $Mdx+Ndy=0$

the eq ~~is exact~~

$M=y\sec^2 x+\sec x\tan x$, $M_y=\sec^2 x$

$N=2y+\tan x$, $N_x=\sec^2 x$

$M_y=N_x$ ∴ the eq. is exact

$F(x,y)=\int Mdx=\int(y\sec^2 x+\sec x\tan x)dx=c$

$=y\tan x+\sec x+h(y)=c$

$\frac{\partial F}{\partial y}=\tan x+h'(y)=N$

$=\tan x+h'(y)=\tan x+2y$

$h(y)=y^2+a$

$F(x,y)=y\tan x+\sec x+y^2=C*$

$\Rightarrow(1)\tan(\frac{\pi}{4})+\sec(\frac{\pi}{4})+(1)^2=C$

$1+\sqrt{2}+1=c \Rightarrow 2+\sqrt{2}$

$F(x,y)=y\tan x+\sec x+y^2-(2+\sqrt{2})$