Exact analytical solution

$y' = \sin^2 x + y \cot x$
Solve the complementary equation:
$y'_1 - y_1 \cot x = 0$
$\frac{\mathrm{d}y_1}{\mathrm{d}x} = y_1 \cot x$
$\int \frac{\mathrm{d}y_1}{y_1} = \int \cot x \mathrm{d}x$
$\ln y_1 = \ln \sin x$
$y_1 = \sin x$
Make a substitution:
$y = y_1*u$
Then:
$\frac{\mathrm{d}u}{\mathrm{d}x} = \frac{\sin^2 x}{\sin x}$
$\int \mathrm{d}u = \int \sin x \mathrm{d}x$
$u = - \cos x + C$
$y = - \cos x \sin x + C \sin x$
Solve Initial Value Problem for:
$x_0 = 1, y_0 = 1$
$y_0 = - \cos x_0 \sin x_0 + C \sin x_0$
$1 = 0 + C$
$C = 1$
The solution for IVP is:
$y = - \cos x \sin x + \sin x$