Differentiation

1. if $\sin y = x \sin(a + y)$, prove that $\frac{dy}{dx} = \frac{sin^2(a+y)}{\sin a}$.
2. if $(\cos x)^y = (siny)^x$, find $\frac{dy}{dx}$.
3. if $y = \frac{sin^{-1}x}{\sqrt{1-x^2}}$, show that
4. $(1 - x^2)\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} - y = 0$
5. Solve the following differential equation :
   $$x\frac{dy}{dx} = y - x\tan\frac{y}{x}$$
6. solve the following differential equation :
   $$cos^2 x\frac{dy}{dx} + y = \tan x$$