Consider the differential equations

\begin{align*}
(1) \quad \frac{dy}{dx} &= \cot(x)y - 2x\sin(x)\sin(x^2). \\
(2) \quad \frac{dy}{dx} &= \cot(x)y.
\end{align*}

a) Show that $y_p(x) = \sin(x)\cos(x^2)$ is a solution of Equation (1)

b) Show that $y_h(x) = \sin(x)$ is a solution of Equation (2)

c) In terms of $y_p$ and $y_h$, what is the general solution to Equation (1)