1.)

a.) $\frac{dy}{dx} + 3x^2 y = x^2$ $\quad \therefore \mu = e^{\int 3x^2\, dx}$

$= e^{x^3}$

$\frac{d}{dx}\left[e^{x^3} y\right] = e^{x^3} x^2 \quad \therefore e^{x^3} y = \int e^{x^3} x^2\, dx$

Let $x^3 = u \quad \therefore \frac{du}{dx} = 3x^2$

$e^{x^3} y = \int \frac{1}{3} e^u\, du = \frac{1}{3} e^u + c \quad \therefore e^{x^3} y = \frac{1}{3} e^u + C$

$\boxed{y = \frac{1}{3} + \frac{c}{e^{x^3}} \quad \text{where } I = (-\infty, +\infty)}$

b.) $x \frac{dy}{dx} - y = x^2 \sin x \quad \therefore \frac{dy}{dx} - \frac{1}{x} y = x \sin x \quad \therefore \mu = e^{\int -\frac{1}{x}\, dx}$

$= e^{-\ln|x|}$

$= \frac{1}{x}$

$\frac{d}{dx}\left[\frac{1}{x} y\right] = \sin x \quad \therefore \frac{1}{x} y = \int \sin x\, dx$

$= -\cos x + C$

$\boxed{y = -x \cos x + xC = x(-\cos x + C) \quad \text{where } I = (-\infty, +\infty)}$

c.) $\cos x \frac{dy}{dx} + (\sin x) y = 1 \quad \therefore \frac{dy}{dx} + \frac{\sin x}{\cos x} y = \frac{1}{\cos x}$

$\mu = e^{\int \tan x\, dx} = e^{-\ln|\cos x|} = \frac{1}{\cos x}$

$\frac{1}{\cos x} y = \int \left[\frac{1}{\cos x}\right]^2 dx \quad \therefore \sec(x) y = \int \sec^2 x\, dx$

$\sec(x) y = \tan(x) + C = \frac{\tan(x)}{\sec(x)} + \frac{C}{\sec(x)}$

$y = \boxed{\sin(x) + C(\cos(x))} \quad \text{where } I = (-\infty, +\infty)$