PRACTICE PROBLEMS FOR DE

I. Proving a Solution

Determine if the following solution is an implicit/explicit solution to the DE.

DE	Solution
$\frac{d^2y}{dx^2} + y = x^2 + 2$	$y = \sin x + x^2$
$x'' + x = 0$	$x = 2\cos t - 3\sin t$
$\frac{d^2\theta}{dt^2} - \theta\frac{d\theta}{dt} + 3\theta = -2e^{2t}$	$\theta = 2e^{3t} - e^{2t}$
$\frac{dx}{dt} + tx = \sin 2t$	$x = \cos 2t$
$\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$	$y = e^{2x} - 3e^{-x}$
$y'' + 4y = 5e^{-x}$	$y = 3\sin 2x + e^{-x}$
$\frac{dy}{dx} = \frac{x}{y}$	$x^2 + y^2 = 4$
$\frac{dy}{dx} = \frac{2xy}{y-1}$	$y - \ln y = x^2 + 1$
$\frac{dy}{dx} = \frac{e^{-xy} - y}{e^{-xy} + x}$	$e^{xy} + y = x - 1$
$\frac{dy}{dx} = 2x\sec(x+y) - 1$	$x^2 - \sin(x+y) = 1$

II. Solve the following DE

- $(e^x + e^{-x})\frac{dy}{dx} = y^2$
- $\frac{dy}{dx} = x\sqrt{1-y^2}$
- $\frac{dy}{dx} = \frac{xy+2y-x-2}{xy-3y+x-3}$
- $\frac{dN}{dt} + N = Nte^{t+2}$
- $\frac{dQ}{dt} = k(Q-70)$
- $(x-y)dx + xdy = 0$
- $(y^2 + yx)dx - x^2dy = 0$
- $\frac{dy}{dx} = \frac{y-x}{y+x}$
- $-ydx + (x + \sqrt{xy})dy = 0$
- $\frac{dy}{dx} = \frac{x+3y}{3x+y}$
- $ydx = 2(x+y)dy$