Linear differential equations

4.1 Solve second order differential equations by reducing to first order:

a) $y''(x^2+1) = 2xy', \quad y(0) = 1,\ y'(0) = 3$

b) $(x+1)y'' + x(y')^2 = y' \quad y(0) = 2,\ y'(0) = 2$

c) $2y'' = e^y \quad y(0) = 0,\ y'(0) = 1$

d) $3y'y'' = 2y \quad y(0) = y'(0) = 1$

4.2 Solve the homogeneous linear differential equations:

a) $y'' - 5y' - 6y = 0$

b) $y'' + 4y' + 4y = 0$

c) $y'' + 4y' + 5y = 0$

d) $y''' - 6y'' + 12y' - 8y = 0$

e) $y^{(4)} + 10y'' + 9y = 0$

f) $y^{(4)} - y = 0$

g) $y^{(4)} + y = 0$

h) $y^{(4)} - y' = 0$

i) $y^{(5)} - 3y^{(4)} + 3y''' - y'' = 0$

j) $y^{(4)} + 4y'' = 0$

k) $y^{(4)} = 2y'' + y = 0$

l) $y^{(4)} + 2y'' - 8y' + 5y = 0$