Problem 1

Solve the differential equation:

$$y'' - 3y' + 2y = 0$$

Problem 2

Show that $y_p = \ln(x)$ is indeed a particular solution to $y'' + y' - 2y = \dfrac{x-1}{x^2} - 2\ln(x)$ and use it to find the general solution.

Problem 3

Solve the first two problems with the initial conditions $y'(1) = 0$ and $y(1) = 0$.

Problem 4

Show that if $y = e^{ix}$ is a solution to the n-th order linear homogeneous differential equation

$$a_n y^{(n)} + a_{n-1} y^{(n-1)} + ... + a_1 y' + a_0 y = 0$$

with constant coefficients, then $y = c_1 \cos(x)$ and $y = c_2 \sin(x)$ for some constants c_1 and c_2 are both solutions to same equation.