

國立臺灣海洋大學河海工程學系 2002 工程數學 (一) 第四次小考

1. Given the nonconstant coefficient second order ODE

$$x^2 y''(x) - 2xy' - 10y = -10$$

(1). Assume the $y = x^n$ for the complementary solution, determine n .

(2). If $y_1(x) = 1/x^2$ is one of the complementary solution, please determine the other one $y_2(x)$ by method of variations of parameters, $y_2(x) = y_1(x)u_1(x)$. Please find $u_1(x)$.

(3). Solve the particular solution by $y_p(x) = y_1(x)v_1(x) + y_2(x)v_2(x)$, where

$$y_1 v_1' + y_2 v_2' = 0$$

$$y_1' v_1' + y_2' v_2' = -10/x^2$$

Please determine v_1, v_2 and y_p .

(4). By changing variable, $x = e^t$ and $y(x) = y(e^t) = Y(t)$, then determine the ODE for $Y(t)$ and solve $Y(t)$ and $y(x)$.