

Engineering Mathematics Homework 4-Solution

1. Solve: $xy' + (1+x)y = e^{-x} \sin 2x$

Sol:

$$y' + \frac{1+x}{x} y = \frac{e^{-x} \sin 2x}{x}$$

$$I = e^{\int \frac{1+x}{x} dx} = e^{\ln x + x} = xe^x$$

$$y = cI^{-1} + I^{-1} \int Ir(x) dx$$

$$= c(xe^x)^{-1} + (xe^x)^{-1} \int (xe^x) \left(\frac{e^{-x} \sin 2x}{x} \right) dx$$

$$= c(xe^x)^{-1} + (xe^x)^{-1} \int \sin 2x dx$$

$$= c(xe^x)^{-1} + (xe^x)^{-1} \left(-\frac{1}{2} \cos 2x \right)$$

2. Solve: (1) $y'' + 6y' + 10y = 0, y = ?$

(2) $y'' + 18y' + 65y = 0, y = ?$

Sol:

(1)

$$\lambda^2 + 6\lambda + 10 = 0$$

$$\lambda = -3 \pm i$$

$$y = e^{-3x} (c_1 \cos x + c_2 \sin x)$$

(2)

$$\lambda^2 + 18\lambda + 65 = 0$$

$$\lambda = -5, -13$$

$$y = c_1 e^{-5x} + c_2 e^{-13x}$$

DCNLAB 可靠計算暨網路實驗室