ENG 381 ASSIGNMENT II

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ENG 381

1. $\frac{d^2y}{d\theta^2} + 4\frac{dy}{d\theta} + 5y = 6\sin\theta$

we observe homogeniby

$y'' + 4y + 5y = 6\sin\theta$

where $y = e^{k\theta}$

$y' = ke^{k\theta}$

$y'' = k^2e^{k\theta}$

$k^2e^{k\theta} + 4(ke^{k\theta}) + 5(e^{k\theta}) = 6\sin\theta$

$k^2e^{k\theta} + 4ke^{k\theta} + 5(e^{k\theta}) = 0$

$e^{k\theta}(k^2 + 4k + 5) = 0$

$k^2 + 4k + 5 = 0$

$k^2 + 4k = -5$

$k^2 + 4k + \left(\frac{1}{2} \times \frac{4}{1}\right)^2 = -5 + \left(\frac{1}{2} \times \frac{4}{1}\right)^2$

$k^2 + 4k + 4 = -5 + 4$

$k^2 + 2k + 2k + 4 = -1$

$(k+2)(k+2) = -1$

$(k+2)^2 = 1$

$k + 1 = \sqrt{-1} \Rightarrow \pm 1$

$k_1 = -2 + 1$ and $k_2 = -2 - 1$

$y_n = C_1y_1 + C_2y_2$

$y_1 = e^{k\theta} = e^{(-2+1)x} = e^{-2x} \cdot e^{1x}$

$y_2 = e^{k_2\theta} = e^{(-2-1)x} = e^{-2x} \cdot e^{1x}$

$y_n = C_1e^{-2x} \cdot e^{1x} + C_2e^{-1x} \cdot e^{1x}$

$y_n = e^{-2x}(C_1e^{1x} + C_2e^{-1x})$

$y_n = e^{-2\theta}(C_1\cos\theta + C_2\sin\theta)$

Assume $y_p = A\cos\theta + B\sin\theta$

$y_p' = -A\sin\theta + B\cos\theta$