كلية العلوم

القسم : **الرياضيات**

السنة : **الثانية**

المادة : معادلات تفاضلية١

المحاضرة : السابعة/عملي/

{{ مكتبة A to Z }}

Facebook Group : مكتبة A to Z

(1) $y'' + 3y' - 4y = 0$

$m^2 + 3m - 4 = 0$

$\Delta = 25 \Rightarrow \sqrt{\Delta} = 5$

$m_1 = \frac{2}{2} = 1 \quad , \quad m_2 = -4$

$y_{h(x)} = C_1 e^{x} + C_2 e^{-4x}$

(2) $y'' + 5y' + 6y = 0$

$m^2 + 5m + 6 = 0$

$\Delta = 25 - 4(1)(6) = 25 - 24 = 1$

$m_1 = \frac{-5+1}{2} = -\frac{4}{2} = -2 \quad , \quad m_2 = \frac{-5-1}{2} = -\frac{6}{2} = -3$

$y_{h(x)} = C_1 e^{-2x} + C_2 e^{-3x}$

(3) $y'' + 2y' + y = 0$

$m^2 + 2m + 1 = 0$

$\Delta = 0$

$m_1 = m_2 = -1$

$y_{h(x)} = (C_1 + C_2 x) e^{-x}$

(4) $2y'' - 3y' = 0$

$2m^2 - 3m = 0$

$m(2m - 3) \Rightarrow m = 0 \quad , \quad m = \frac{3}{2}$

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$y_c = C_1 + C_2 e^{\frac{3}{2}x}$

(5) $y'' - 4y' + 4y = 0$

$m^2 - 4m + 4 = 0$

$\Delta = 16 - 4(1)(4) = 0$

$m_1 = m_2 = -\frac{b}{2a} = \frac{4}{2} = 2$

$y_{h(x)} = (C_1 + C_2 x) e^{2x}$

(6) $y'' - 2y' + 5y = 0$

$m^2 - 2m + 5 = 0$

$\Delta = 4 - 4(5)(1) = 4 - 20 = -16 < 0$

$-16 = \mp 4i$

$m_1 = \frac{2 + 4i}{2} = -1 + 2i$, $m_2 = \frac{-b - \sqrt{\Delta}}{2a} = -1 - 2i$

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

(7) $y'' + 9y = 0$

$m^2 + 9 = 0$

$m^2 = -9 \Rightarrow m = \mp 3i$

$y = (C_1 \cos 3x + C_2 \sin 3x)$

(8) $(D^3 - 3D^2 + 3D - 1)(D^2 + 2D + 1)y = 0$

$(m^3 - 3m^2 + 3m - 1)(m^2 + 2m + 1) = 0$

$(m-1)^3 (m+1)^2 = 0$

$m_1 = m_2 = m_3 = 1$

$m_4 = m_5 = -1 \Rightarrow y_{h(x)} = (C_1 + C_2 x + C_3 x^2) e^x + (C_4 + C_5 x) e^{-x}$

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9. $(D^4 - 2D^2 - 3)y = 0$

$D = m \Rightarrow m^4 - 2m^2 - 3 = 0$

$m^2 = Z$

$\Rightarrow Z^2 - 2Z - 3 = 0$

$(Z+3)(Z-1) = 0$

$Z = -3 \Rightarrow m^2 = -3 \Rightarrow m = \pm\sqrt{3}i$

$Z = 1 \Rightarrow m^2 = 1 \Rightarrow m = \pm 1$

$y_{h(x)} = (C_1 \cos\sqrt{3}x + C_2 \sin\sqrt{3}x) + C_3 e^{-x} + C_4 e^{x}$

انتهت المحاضرة

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