Matemātika 2. Mājasdarba kļūdu labojums.

Diferenciālvienādojumi

Iaroslav Viazmitin, 7. grupa, 27. variants

1) $(1+e^x)y \cdot y' = e^x$

$(1+e^x)y \cdot \dfrac{dy}{dx} = e^x$

$ydy = \dfrac{e^x}{1+e^x}dx$

$\int ydy = \int \dfrac{d(e^x+1)}{e^x+1}$

$0,5y^2 = \ln|e^x+1| + \mathrm{C}$

$\mathrm{C} = 0,5y^2 - \ln|e^x+1|$

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6) $y'' + 25y = 3\sin 5x - \cos 5x + 15x$

$y_{\text{visp.}} = \overline{y} + y^*$

$\overline{y} : y'' + 25y = 0$

$k^2 + 25 = 0$

$k_{1,2} = \pm 5i$

$\overline{y} = \mathrm{C}_1 \cos 5x + \mathrm{C}_2 \sin 5x$

$y^* : f(x) = \underbrace{3\sin 5x - \cos 5x}_{f_1(x)} + \underbrace{15x}_{f_2(x)}$

$f_1(x) = 3\sin 5x - \cos 5x$

$f_1(x) : \begin{array}{ccc|c} n & \alpha & \beta & s \\ \hline 0 & 0 & 5 & 0 \end{array} \ (\forall k \ \ k \neq \pm\beta i)$

$y_1^* = A\cos 5x + B\sin 5x$

$f_2(x) = 15x$

$f_2(x) : \begin{array}{ccc|c} n & \alpha & \beta & s \\ \hline 1 & 0 & 0 & 0 \end{array} \ (\forall k \ \ k \neq 0)$

$y_2^* = Q_n(x) = Dx$

$y^* = y_1^* + y_2^* = A\cos 5x + B\sin 5x + Dx$

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7) $y''' - 2y'' - 3y' = (1-x)e^{3x} - 4 + 2e^x$

$y_{\text{visp.}} = \overline{y} + y^*$

$\overline{y} : y''' - 2y'' - 3y' = 0$

$k^3 - 2k^2 - 3k = 0$

$k(k^2 - 2k - 3) = 0$

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

$k_1=-1, k_2=0, k_3=3$

$\overline{y}=\mathrm{C}_1e^{-x}+\mathrm{C}_2+\mathrm{C}_3e^{3x}$

$y^*: f(x)=\underbrace{(1-x)e^{3x}}_{f_1(x)}\underbrace{-4}_{f_2(x)}+\underbrace{2e^x}_{f_3(x)}$

$f_1(x)=(1-x)e^{3x}$

$f_1(x): \begin{array}{ccc|c} n & \alpha & \beta & s \\ \hline 1 & 3 & 0 & 1 \end{array} (k_3=3)$

$y_1^*=(Ax+B)e^{3x}\cdot x$

$f_2(x)=-4$

$f_2(x): \begin{array}{ccc|c} n & \alpha & \beta & s \\ \hline 0 & 0 & 0 & 1 \end{array} (k_2=0)$

$y_2^*=Dx$

$f_3(x)=2e^x$

$f_3(x): \begin{array}{ccc|c} n & \alpha & \beta & s \\ \hline 0 & 1 & 0 & 0 \end{array} (\forall k \;\; k\neq\alpha)$

$y_3^*=Ge^x$

$y^*=(Ax+B)e^{3x}\cdot x+Dx+Ge^x$

$y_{\text{visp.}}=\overline{y}+y^*=\mathrm{C}_1e^{-x}+\mathrm{C}_2+\mathrm{C}_3e^{3x}+(Ax+B)e^{3x}\cdot x+Dx+Ge^x$