

TUGAS MATEMATIKA 2

Jilid 2



Oleh :

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POLITEKNIK ELEKTRONIKA NEGERI SURABAYA

1. Manakah PDB non homogen di bawah ini yang dapat dipecahkan menggunakan metode koefisien tak tentu, dan manakah yang menggunakan variasi parameter dalam menentukan solusinya? Sebutkan dan jelaskan! Serta tentukan solusi umumnya!

a. $y''' - 4y'' + 4y' = 80 \cos 2x$

Jawab :

Handwritten solution for problem a:

$$\begin{aligned}
 & a. \quad y''' - 4y'' + 4y' = 80 \cos 2u \\
 & \quad \hookrightarrow y^3 - 4y^2 + 4y' - 80 \cos(2u) = 0 \\
 & \quad = f(u, y) = y^3 - 4y^2 + 4y' - 80 \cos(2u) \\
 & \quad \hookrightarrow f_u = 160 \sin(2u) \quad \left\{ \text{Derivatif} \right\} \\
 & \quad f_y = 3y^2 - 8y + 4 \\
 & \quad f_u = 160 \sin(2u) \\
 & \quad f_y = 3y^2 - 8y + 4 \rightarrow \frac{dy}{du} = -\frac{f_u}{f_y} \\
 & \quad \hookrightarrow \frac{dy}{du} = -\frac{160 \sin(2u)}{3y^2 - 8y + 4}
 \end{aligned}$$

b.

$y'' - 4y' + 8y = 34e^x \sin 2x$

Jawab :

Handwritten solution for problem b:

$$\begin{aligned}
 & b. \quad y'' - 4y' + 8y = 34e^x \sin 2u \\
 & \quad \hookrightarrow y^2 - 4y' + 8y - 34e^x \sin(2u) = 0 \\
 & \quad = f(u, y) = y^2 - 4y' + 8y - 34e^x \sin(2u) \\
 & \quad \hookrightarrow f_u = -34e^x \sin(2u) - 68e^x \cos(2u) \quad \left\{ \text{Derivatif} \right\} \\
 & \quad f_y = 2y + 4 \\
 & \quad f_u = -34e^x \sin(2u) - 68e^x \cos(2u) \\
 & \quad f_y = 2y + 4 \rightarrow \frac{dy}{du} = -\frac{f_u}{f_y} \\
 & \quad \hookrightarrow \frac{dy}{du} = -\frac{-34e^x \sin(2u) - 68e^x \cos(2u)}{2y + 4} \\
 & \quad \hookrightarrow \frac{dy}{du} = -\frac{2(-17e^x \sin(2u) - 34e^x \cos(2u))}{2(y + 2)} \\
 & \quad \hookrightarrow \frac{dy}{du} = \frac{17e^x \sin(2u) + 34e^x \cos(2u)}{y + 2}
 \end{aligned}$$

c.

$$y'' + y = \tan x$$

Jawab :

Handwritten solution for the differential equation $y'' + y = \tan x$ using the method of variation of parameters.

c. $y'' + y = \tan x$
 $\hookrightarrow y^2 + y - \tan(x) = 0$
 $f(x, y) = y^2 + y - \tan(x)$
 $\hookrightarrow f_u = -\sec(x)^2$
 $f_y = 2y + 1$
 $f_u = -\sec(x)^2$
 $f_y = 2y + 1 \rightarrow \frac{dy}{dx} = -\frac{f_u}{f_y}$
 $\hookrightarrow \frac{dy}{dx} = -\frac{-\sec(x)^2}{2y + 1}$
 $\hookrightarrow \frac{dy}{dx} = \frac{\sec(x)^2}{2y + 1}$

{ Derivatif }