Xyba Project

Persamaan Differensial Biasa

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3. This document is created by Xyba, Student of Mathematics University of Indonesia Batch 2016

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Thank you for your cooperation >v<

1. $\frac{dy}{dx} + y^2 \sin x = 0$

   $\frac{dy}{dx} = -y^2 \sin x \Leftrightarrow -\frac{1}{y^2} dy = \sin x \, dx \Leftrightarrow \frac{1}{y} = -\cos x + C \Leftrightarrow \frac{1}{y} + \cos x = C$

2. $\frac{dy}{dx} = \frac{x^2}{y(1+x^3)}$

   $y \, dy = \frac{x^2}{1+x^3} \, dx \Leftrightarrow \frac{1}{2} y^2 = \frac{1}{3} \ln|1 + x^3| + C \Leftrightarrow 3y^2 - 2\ln|1 + x^3| = C_0$

3. $x \frac{dy}{dx} = \sqrt{1 - y^2}$

   $\frac{1}{\sqrt{1-y^2}} dy = \frac{1}{x} dx \Leftrightarrow \arcsin y = \ln|x| + C \Leftrightarrow \arcsin y - \ln|x| = C$

4. $\frac{dy}{dx} = (1 - 2x) \, y^2, y(0) = -\frac{1}{6}$

   $\frac{1}{y^2} dy = (1 - 2x) dx \Leftrightarrow -\frac{1}{y} = x - x^2 + C$

   $y(0) = -\frac{1}{6} \rightarrow 6 = 0 - 0 + C \rightarrow C = 6 \rightarrow \frac{1}{y} - x^2 + x + 6 = 0$

5. $\frac{dr}{d\theta} = \frac{r^2}{\theta}, r(1) = 2$

   $\frac{1}{r^2} dr = \frac{1}{\theta} d\theta \Leftrightarrow -\frac{1}{r} = \ln|\theta| + C$

   $r(1) = 2 \rightarrow -\frac{1}{2} = \ln|1| + C \rightarrow -\frac{1}{2} = 0 + C \rightarrow C = -\frac{1}{2} \rightarrow \frac{1}{r} + \ln|\theta| - \frac{1}{2} = 0$

6. $\frac{dy}{dx} = \cos^2 x \cdot \cos^2 2y$

   $\frac{1}{\cos^2 2y} dy = \cos^2 x \, dx \Leftrightarrow \sec^2 2y = \left(\frac{1}{2} + \frac{1}{2}\cos 2x\right) dx \Leftrightarrow \frac{1}{2}\tan 2y = \frac{1}{2}x + \frac{1}{4}\sin 2x + C$

   $\Leftrightarrow 2\tan 2y - 2x - \sin 2x = C_0$

7. $y^2\sqrt{1 - x^2} dy = \arcsin x \; dx, y(0) = 0$

   $y^2 dy = \frac{\arcsin x}{\sqrt{1-x^2}} dx \Leftrightarrow \frac{1}{3} y^3 = \frac{1}{2} (\arcsin x)^2 + C$

   $y(0) = 0 \rightarrow 0 = 0 + C \rightarrow C = 0 \rightarrow 2y^3 - 3(\arcsin x)^2 = 0$