6D Understanding Procedures to Solve Differential Equations

Practice p321(39-44)
p355(1-10, 25-27)

i $\sqrt{-1}$

$$\frac{d}{dx}[lx]\cdot\left[\frac{1}{o}\right]^{-1}\frac{d^{-1}}{dt^{-1}}[a]\cdot\left(\frac{\overset{1}{\cancel{2-\ln e}}}{e^{-1}}\right)$$

l o v e

U + ME

=

CALCULUS

u $e^{\ln u}$

i $\sqrt{-1}$

lo v e

$$\frac{\cancel{lo^{2}v\cdot 2.718281828\ldots}}{\cancel{o}}$$

U

$\sqrt{-1}$

$$\left(\int_{o}^{2o} l\,dx\right)v\left(\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{x}\right)$$

love

$$\frac{t^{3}u^{2}v^{0}}{t^{3}u^{2-1}}$$

ex Solve $\frac{dy}{dx} = (x+3)(y+4)$

$$\frac{1}{y+4}\,dy = (x+3)\,dx$$

$$\underbrace{\int \frac{1}{y+4}\,dy}_{} = \underbrace{\int (x+3)\,dx}_{}$$

$$\ln|y+4| + C_1 = \frac{x^2}{2} + 3x + C_2$$

$$\ln|y+4| = \frac{x^2}{2} + 3x + C_3$$

$$|y+4| = e^{x^2/2 + 3x + C_3}$$

$$y+4 = \pm e^{x^2/2+3x+C_3}$$

$$y = -4 \pm e^{x^2/2+3x+C_3}$$

$$y = -4 \pm e^{x^2/2+3x} \cdot e^{C_3}$$

$$y = -4 \pm C_4 \cdot e^{x^2/2+3x}$$

$$\boxed{y = -4 + C e^{x^2/2+3x}}$$

Check: $\frac{dy}{dx} = \underbrace{\left(C \cdot e^{x^2/2+3x}\right)}_{y+4}(x+3)$

ex solve $\frac{dy}{dt} = .05y$

$$\int \frac{1}{y}\,dy = \int .05\,dt$$

$$\ln|y| + C_1 = .05t + C_2$$

$$\ln|y| = .05t + C_3$$

$$|y| = e^{.05t + C_3}$$

$$|y| = e^{.05t} \cdot C_4$$

$$y = \pm e^{.05t} \cdot C_4$$

$$\boxed{y = C \cdot e^{.05t}}$$

Ck: $\frac{dy}{dt} = \underbrace{C \cdot e^{.05t}}_{y} \cdot (.05)$

☺

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ex $\frac{dy}{dt} = 8y \quad , y(0) = 100$

$$\int \frac{1}{y}\,dy = \int 8\,dt$$

$$\ln|y| = 8t + c_1$$

$$|y| = e^{8t + c_1}$$

$$y = \pm e^{8t} \cdot c_2$$

$$y = c \cdot e^{8t}$$

$$100 = c \cdot e^{0}$$

$$c = 100$$

$$\boxed{y = 100 \cdot e^{8t}}$$

ex $\frac{dy}{dt} = K \cdot y$ for a constant K.

$$\boxed{y = C \cdot e^{Kt}}$$

$$\frac{e^x}{}\qquad \frac{dy}{dx} = e^{y-x}$$

$$\frac{dy}{dx} = \frac{e^y}{e^x}$$

$$\int \frac{1}{e^y}\,dy = \int \frac{1}{e^x}\,dx$$

$$\int e^{-y}\,dy = \int e^{-x}\,dx$$

$$\vdots$$

ex

$$\frac{dy}{dx} = x\sqrt{y}\cos^2\sqrt{y}$$

$$\underbrace{\int \frac{1}{\sqrt{y}\cos^2\sqrt{y}}\,dy}_{} = \int x\,dx$$

$$\left(\text{* see next page}\right) = \frac{x^2}{2} + C$$

$$2\tan\sqrt{y} + C_1 = \frac{x^2}{2} + C_2$$

$$\boxed{y = \left[\tan^{-1}\left(\frac{x^2}{4} + C\right)\right]^2}$$

$$2\int \frac{1}{2\sqrt{y}} \frac{1}{\cos^2\sqrt{y}}\,dy$$

$$u = \sqrt{y}$$

$$du = \frac{1}{2\sqrt{y}} \cdot dy$$

$$= 2\int \frac{1}{\cos^2 u}\,du$$

$$= 2\int \sec^2 u\,du$$

$$= 2\tan u + C$$

$$= 2\tan\sqrt{y} + C$$