diff ecuations | moar misoufer

1. $(x + ye^{y/x})\,dx - xe^{y/x}\,dy = 0, \quad y(1) = 0$

$F_x = M = x + ye^{y/x} \quad F_y = N = -xe^{y/x}$

$M_y = e^{y/x} + ye^{y/x}\left(\frac{1}{x}\right)$

$N_x = -e^{y/x} - xe^{y/x}\left(\frac{-y}{x^2}\right)$

$M_y = e^{y/x}\left[1 + \frac{y}{x}\right]$

$N_x = e^{y/x}\left[-1 + \frac{y}{x}\right]$

$\left[\frac{M_y - N_x}{N}\right] \left[\frac{N_x - M_y}{M}\right]$

$$\frac{e^{y/x}\left[1 + \frac{y}{x}\right] - e^{y/x}\left[-1 + \frac{y}{x}\right]}{-xe^{y/x}}$$

$$= \frac{\left[1 + \frac{y}{x}\right] + \left[1 - \frac{y}{x}\right]}{-x}$$

$$= \frac{-2}{x}$$

$u(x) = e^{\int -\frac{2}{x}\,dx} = e^{-2\ln(x)}$

continues

diff equations | Mozer mystery

1. $e \ln\left(\frac{1}{x^2}\right)$

$$F_y = m = \cancel{\frac{x}{x^2}} + \frac{y e^{y/x}}{x^2}$$

$$N = \frac{-x\, \cancel{e^{y/x}}}{x^2} \rightarrow \frac{-e^{y/x}}{x}$$

$$m_y = \frac{1}{x^2}\left[e^{y/x} + y e^{y/x}\left(\frac{1}{x}\right)\right] = \frac{e^{y/x}}{x^2}\left[1 + \frac{y}{x}\right]$$

$$N_x = \frac{1}{x^2} e^{y/x} + \left(-\frac{1}{x}\right) e^{y/x}\left(\frac{-y}{x^2}\right)$$

$$= \frac{1}{x^2} e^{y/x} \frac{y}{x^3} e^{y/x} =$$

$$\frac{e^{y/x}}{x^2}\left[1 + \frac{y}{x}\right]$$

$$F = \int N\, dy = \int \frac{-e^{y/x}}{x}\, dy = \frac{-1}{x}\int e^{y/x} dy$$

$$= \frac{-1}{x}\left(x e^{y/x}\right) + g(x)$$

$$F = -e^{y/x} + g(x)$$

$$F_x = \frac{-y}{x^2}\left(-e^{y/x}\right) + g'(x) = m$$

$$= \frac{y e^{y/x}}{x^2} + g'(x) = \frac{1}{x} + \frac{y e^{y/x}}{x^2}$$

(continues)

$$g'(x) = \frac{1}{x} \qquad g(x) = \ln(x) + C$$

diff equations [illegible]

1. $F = -e^{y/x} + \ln(x) + c = 0$

$y(1) = 0 \rightarrow e^{y/x} = \ln(x) + c$

$\rightarrow c = 1$

$e^{y/x} = \ln(x) + 1$

Noor mustafa | diff equations

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

$$\frac{dy}{dx} + P(X) y = Q(X)$$

$$\frac{dy}{dx} + \tan(x) y = \frac{1}{\cos(x)}$$

$$\frac{dy}{dx} + \underbrace{(\tan x)}_{p} y = \underbrace{\sec(x)}_{Q}$$

$$e^{\int \tan(x)\,dx} = e^{\ln|\sec(x)|}$$

$$= \sec(x)$$

$$\int \frac{d}{dx}[\sec(x) y] = \int \sec^2(x) + C$$

$$\sec(x) y = \tan(x) + C$$

$$y = \frac{\tan(x)}{\sec(x)} + \frac{C}{\sec(x)}$$

diff equations | Nowr mixture

3. $(x+1)\frac{dy}{dx}+y=\ln x \quad y(1)=10$

$$\frac{dy}{dx}+\underbrace{\left(\frac{1}{x+1}\right)}_{P}y=\underbrace{\frac{\ln x}{x+1}}_{Q}$$

$$\frac{d}{dx}\left[e^{\int P}y\right]=\frac{\ln x}{x+1}e^{\int P}$$

$$e^{\int P}=e^{\ln(x+1)}=x+1$$

$$\int\frac{d}{dx}\left[(x+1)y\right]=\int\ln|x|$$

integrate by parts

$$\frac{(x+1)y}{x+1}=\frac{x\ln(x)-x+c}{x+1}$$

$y(1)=10$

$$y=\frac{x\ln(x)}{x+1}-\frac{x}{x+1}+\frac{c}{x+1}$$

$$10=\frac{0}{2}-\frac{1}{2}+\frac{c}{2}$$

$$10=-\frac{1}{2}+\frac{c}{2}$$

$$c=21$$

3.

diff equations
Nour mustafa

$$y = \frac{x\ln(x)}{x+1} - \frac{x}{x+1} + \frac{21}{x+1}$$

4. diff equations Nour Mustafa

$F_x = M = 3x^2y + e^y \qquad F_y = N = x^3 + xe^y - 2y$

$M_y = 3x^2 + e^y \qquad N_x = 3x^2 + e^y$

$F = \int M\,dx = \int 3x^2y + e^y\,dx$

$= x^3y + xe^y + g(y)$

$F_y = x^3 + xe^y + g'(y) = N$

$x^3 + xe^y - 2y = x^3 + xe^y + g'(y)$

$g'(y) = -2y \qquad g(y) = -y^2 + c$

$F = x^3y + xe^y - y^2 + c = 0$

$x^3y + xe^y - y^2 + c = 0$

5. diff equation noor mustafa

ϕ bernoulli

$$\frac{dy}{dx} = y(xy^3 - 1)$$

$$\frac{dy}{dx} + y = xy^4$$

$P(x) = 1$

$f(x) = x$

$n = 4$

$$u = y^{-3}$$

$$\frac{du}{dy} = \frac{1}{y^3} = \frac{-3}{y^4}$$

$$\cancel{du = \frac{-3}{y^4}} \qquad dy = \frac{-y^4}{3} du$$

$$y^3 = \frac{1}{u} \qquad y = \frac{1}{u^{1/3}}$$

$$\frac{-y^4}{3} \frac{du}{dx} + y = xy^4$$

$$\frac{du}{dx} - \frac{3y}{y^4} = \frac{-3xy^4}{y^4} = -3x$$

$$\frac{du}{dx} - \frac{3}{y^3} = -3x$$

$$\frac{du}{dx} - \frac{3}{1/u} = -3x$$

$$\frac{du}{dx} - 3u = -3x$$

ϕ continues

5. Nour mystery diff equations

$$\frac{du}{dx} - 3u = -3x$$

$$u = ab$$

$$a\frac{db}{dx} + b\frac{da}{dx} - 3ab = -3x$$

$$a\frac{db}{dx} + b\left(\cancel{\frac{da}{dx} - 3a}\right) = -3x$$

$$\frac{da}{dx} - 3a = 0$$

$$\frac{da}{a} = 3\,dx$$

$$\ln(a) = 3x + c$$

$$a = Ke^{3x}$$

$$a\frac{db}{dx} = -3x$$

$$\frac{db}{dx} = \frac{-3x}{Ke^{3x}}$$

$$db = \frac{-3}{K}xe^{-3x}\,dx$$

$$b = \frac{-3}{K}\left[\int xe^{-3x}\,dx\right]$$

$$b = \frac{-3}{K}\left[\frac{xe^{-3x}}{-3} - \frac{e^{-3x}}{9}\right.$$

$$b = \frac{e^{-3x}}{K}\left[x + \frac{1}{3}\right] + \frac{c}{K}$$

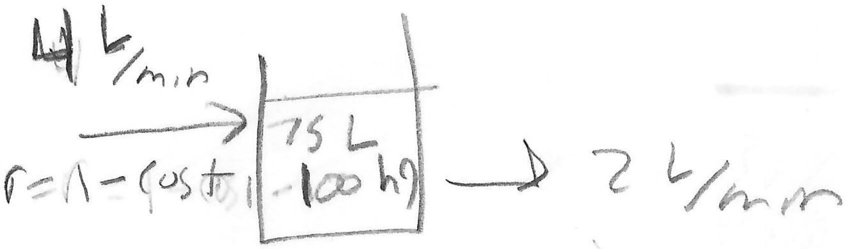
$$u = Ke^{3x}\left[\frac{e^{-3x}}{K}\left(x + \tfrac{1}{3}\right) + \frac{c}{K}\right.$$

$$u = ce^{3x} + x + \tfrac{1}{3}$$

$$\boxed{y = \frac{1}{\left(ce^{3x} + x + \frac{1}{3}\right)^{\frac{1}{3}}}}$$

differential equation | Non multifu

6.



$$\frac{dA}{dt} = R_{in} - R_{out}$$

$A(t) = ?\ kg/L \qquad A(0) = \frac{100}{75}$

$$\frac{dA}{dt} = 4(1-\cos t) - 2A$$

$$\frac{dA}{dt} = 4 - 4\cos t - 2A$$

$\frac{dy}{dx} + P(x)y = Q(x)$

use linear equation

$$\frac{dA}{dt} + 2A = 4 - 4\cos t$$

$A = u \cdot v \qquad v\frac{du}{dt}\ u\frac{dv}{dt} + 2uv = 4 - 4\cos t$

$$v\frac{du}{dt} + u\underbrace{\left[\frac{dv}{dt} + 2v\right]}_{=0} = 4 - 4\cos t$$

$\frac{dv}{dt} + 2v = 0$

$\int \frac{dv}{d} = \int -2dt$

$\ln v = -2t + c$

$v = e^{-2t+c}$

$v = Ke^{-2t}$

$v\frac{du}{dt} = 4 - 4\cos t$

$Ke^{-2t}\frac{du}{dt} = 4 - 4\cos t$

$\frac{du}{dt} = \frac{4e^{2t}}{K} - \frac{4e^{2t}\cos t}{K}$

$\frac{du}{dt} = \frac{4}{K}\left[e^{2t} - e^{2t}\cos t\right]$

6. differential equations Noor Mustafa

$$\int du = \frac{4}{k}\int e^{2t} - e^{2t}\cos t \, dt$$

$$u = \frac{4}{k}\left[\frac{1}{2}e^{2t} \int -e^{2t}\cos t \, dt\right]$$

$u = e^{2t}$ $\quad \int u\,dv = uv - \int u\,dv$

$\int dv = \int \cos t \, dt$ $\quad \int e^{2t}\cos t \, dt = e^{2t}\sin t - \int 2e^{2t}\sin t \, dt$

$v = \sin t$ $\quad u = e^{2t}$

$dv = \sin t$

$$\int 2e^{2t}\sin t \, dt = -2e^{2t}\cos t - \int -4e^{2t}\cos t \, dt -$$

$$\int e^{2t}\cos t \, dt = e^{2t}\sin t + 2e^{2t}\cos t - \int 4e^{2t}\cos t \, dt$$

$$u = \frac{4}{k}\left[\frac{1}{2}e^{2t} - \left(\frac{1}{5}e^{2t}\sin t + \frac{2}{5}e^{2t}\cos t\right) + C\right]$$

$$A = ke^{-2t}\left(\frac{4}{k}\right)\left[\frac{1}{2}e^{2t} - \frac{1}{5}e^{2t}\sin t - \frac{2}{5}e^{2t}\cos t\right]$$

$$A = 4Ce^{-2t} + 2 - \frac{4}{5}\sin t - \frac{8}{5}\cos t$$

$$\frac{100}{75} = 4C + 2 - \frac{8}{5}$$

$$\frac{220}{75} = 4C + 2$$

$-2 \quad -2$

$$\frac{70}{75} = 4C$$

$/4 \quad /4$

$$C = \frac{7}{30}$$

$$\boxed{A = \frac{28}{30}e^{-2t} + 2 - \frac{4}{5}\sin t - \frac{8}{5}\cos t}$$

6. diff equations Mixer problem

$\Delta F = 4 - 2 = 2\ L/min$ $\qquad \Delta V = \Delta f \cdot t$

$95 - 70 = 25\ L$

$25\ L \cdot \frac{1\ min}{2\ L} = 12.5\ min$

$A = \frac{28}{30} e^{-2t} + 2 - \frac{4}{5} \sin t - \frac{8}{5} \cos t$

$A = .4565802712\ Hg/L$

$A \cdot 95\ L = 43.38\ Hg$

$43.38\ Hg$

diff equations Noor my Jaren

bad d? ice

7.

$$\frac{\partial T}{\partial t} = k(T - T_m)$$

The heat sink is much hotter then

$T(0) = 27°C$

$T(2) = 26°C$

$T_m = 24°C$

$T_m = 75.2°F$

$$\frac{\partial T}{\partial t} = k(T-24)$$

$$\int \frac{\partial t}{(T-24)} = \int k\, \partial t$$

$$\ln(T-24) = k + tc$$

$$T(t) = 24 + ce^{kt}$$

$27 = 24 + c(1)$

$c = 3$

$26 = 24 + 3e^{k2}$

$\frac{2}{3} = e^{2k}$

$\frac{1}{2}\ln\left(\frac{2}{3}\right) = k$

$$T(t) = 24 + 3e^{.5\ln\left(\frac{2}{3}\right)t}$$

$$T = 24.4°C$$

$$.4 = 3e^{.5\ln\left(\frac{2}{3}\right)t}$$

$$2\ln\left(\frac{.4}{3}\right) = \ln\left(\frac{2}{3}\right)t$$

$$t = 9.94\,min$$