$\left[\int -1/v + 1/(v-1) + 1/(v+1)\right] dv = \int dx \; 1/2$

$\int -1/v + \int 1/(v-1) + dv + \int 1/(v+1)\, dv = \int 1/x \, dv$

$-\ln v + \ln(v-1) + \ln(v+1) = \ln x + C$

$\ln(v-1)(v+1) - \ln v = \ln x + \ln A$

$\frac{v^2-1}{v} = AC$

$y - vx$

$\frac{(v/x)^2-1}{(y/x)} = AC$

$\cancel{y} \; y - vx$

$\frac{(v/x)^2-1}{(y/x)} = AC$

$y^2/x^2 - 1 = Ax \cdot y/x$

$\frac{y^2}{x^2} - 1 = Ay$

$\frac{y^2-x^2}{x^2} = Ay$

$y^2 - x^2 = Ayx^2$

$y^2 = Ax^2y + x^2$

$y^2 = x^2(Ay+1)$

Sub equ 2 and 3 in 4

$dz/dy - z^2/x = -2$

$p = -2/x, \; Q = -2$

$\int p\,dx - 2(\ln)x$

$If = e^{-2\ln x} = x$

$z \cdot I = \int Q \cdot If \cdot dx$

$z \cdot x^{-2} = \int -2x^{-2}\,dx$

$= \frac{-2x^{-1}}{-1} + c$

$z \cdot x^{-2} = 2x^{-1} + c$

$z = \frac{2x^{-1}}{x^{-2}} + \frac{c}{x^{-2}}$

$z = 2x + cx^2$

$z = x(2+x)$

$z = y^{-2}$

$y^{-2} = x(2+cx)$

$1/y^2 = x(2+cx)$

$y^2 = \frac{1}{x(2+cx)}$

$y = \sqrt{\frac{1}{x+(2+cx)}}$

$\cancel{y = \frac{1}{\sqrt{x+(2+x)}}}$

$y = \frac{1}{\sqrt{x+(2+x)}}$

e. $x^2\, dy/dx = x^3 \sin 3x + 4$

$dy/dy = x \sin 3x + 4$

$\int dy/dx = \int x^4 \sin 3x + \int 4x^{-2}$

$= 1/3 \cos 3x + \int 4/3 \cos 2x + 4x^{-1}$

$y = \frac{\sin 3x}{9} - \frac{x \cos 3x}{3} - \frac{4}{x}$

f. $(x^3 + xy^2)\, dy/dx = 2y^3$

$y = vx$

$\frac{dy}{dx} = v + x\frac{dv}{dx}$

$v + x\, dv/dx = 2(vx)^3/x^3 + v^2 x$

$v + x\, dy/dx =$

$= \frac{x^3(2v^3)}{x^3(1+v^2)}$

$x\, dv/dx = \frac{2v^3}{1+v^2}$

$x\, dv = v^3$

$\frac{1+v^2}{v^3-v}\, dv - \frac{1}{x}\, dx$

$v(v-1)(v+1) = v^3 - v$

$\frac{1+v^2}{v^3-v} = \frac{A}{v} + \frac{B}{v-1} + \frac{C}{v+1}$

$v^3 - v$

$1+v^2 = A(v-1)(v+1) + B(v)(v+1) + C(v)(v-1)$

$1+1^2 = B(1)(2)$

$2 = B(2)$

$B = 1$

$v = -1$

$1 + (-1)^2 = (-1)(-1-1)$

$2 = 2c$

$\therefore c = 1$

$v = 0$

$1 + (0)^2 = A(0-1)(0+1)$

$1 = A(-1)(1)$

$\cancel{A = 1} = \cancel{A}\,1$

$A = -1$

AGWU CICHE A   18/ENG05/008

MECHATRONICS

1) $\frac{dy}{dx} = 2\sinh x - y\tan x$

$\frac{dy}{dx} + y\tanh x = \sinh x$

$p = \tanh x$

$Q = 2\sinh x$

$\int p\,dx = \int \tanh x = \int \frac{\sinh x}{\cosh x}\,dx$

$\cosh x = q$

$\int \frac{dy}{dx} = \sinh x, \quad dx = \frac{dy}{\sinh x}$

$\int \frac{\sinh x}{4} \frac{dy}{\sinh x}$

$\int \frac{1}{q}\,du = \ln u = \ln\cosh x$

$If\ e^{\int p\,dx} = e^{\ln\cosh x}$

Then if $y\,If = \int Q\,I_f\,dx$

$y\cosh x = \int 2\sinh x \cosh x$

$2\sin x \cos x = \sin(2x)$

$y \cdot \cosh x = \frac{1}{2} \cdot \cosh 2x + c$

$y = \frac{\cosh 2x + c}{2}$

$y = \frac{\cosh 2x + 2}{\cosh x}$

$e = 2c = -h$

$y = \frac{\cosh 2x\ 1 - A}{\cosh x}$

b. $\frac{dy}{dx}\ dy/dx + 2y = e^{3x}$

$p = 2 \quad \int p\,dx = 2x$

$Q = e^{2x}$

$I_f = e^{\int p\,dx} = e^{2x}$

$y \cdot I_f = \int q \cdot I_f\,dx$

$y \cdot e^{2x} = \int e^{3x}\,e^{2x}\,dx$

$y \cdot e^{2x} = \int e^{3x}\,dx$

$y = \frac{\frac{1}{2}e^{-3x} + C}{e^{2x}}$

c) $dy/dx = 3x^2 + 2x - 3$

$dy/dx = x + 2 - 3/x$

$\int \frac{dy}{dx} = \int x + 2 - \frac{3}{x}\,dx$

$y = \frac{x^2}{2} + 2x - 3\ln x + c$

dy

d) $dy/dx + y/x - y^3$

$dy/dx\ y^{-3} + y^{-2}/x = 1$

$z = y^{1-n}, \quad n = 3$

$z = y^{1-3}, \quad z = y^{-2}$

$dz/dy = -2y^{-3}\,dy/dx$

Then multiply equ by $1-n$

$-2y^{-3}\ dy/dx = \frac{2y^{-2}}{x} = -2$

$d\ dz/dy = \frac{-2y^{-3}dy}{dx}$