ADENIRAN MUSTAQEEMAT ADEDAMOLA
COMPUTER ENGINEERING
18/ENG02/007

c) $dy/dx + y\tan 4x = 2\sin 4x$

$P = \tan 4x \quad , \quad Q = 2\sin 4x$

$\int P\,dx = \int \tan 4x = \int \frac{\sin 4x}{\cos 4x} \cdot dx$

$= \ln \cos 4x$

$I.F = e^{\sin 4x} = e^{\ln \cos 4x} = \cos 4x$

$y \cdot I.F = \int Q \cdot I.F \cdot dx$

$y \cdot \cos 4x = \int x \sin 4x \cdot \cos 4x\,dx$

$2\sin 4x \cdot \cos 4x = \sin 42x$

$y \cdot \cos 4x = \int \sin 42x \cdot dx$

$y \cdot \cos 4x = \frac{1}{2} \times 2\cos 2x + C$

$y - \cos 4x = \cos 42x + C$

$y = \frac{\cos 42x + c}{\cos 4x}$

b) $dy/dx + 2y = e^{3x}$

$P = 2, \; Q = e^{3x}$

$\int P\,dx = 2x, \; I.F = e^{2x}$

$y.I.F = \int Q \cdot I.F\,dx$

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

$ye^{2x} = \int e^{5x}\,dx$

$ye^{2x} = \frac{e^{5x}}{5} + C$

$y = \frac{e^{3x}}{5} + Ce^{-2x}$

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

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

$\int dy = \int x + 2 - 3/x\,dx$

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

d) $x^2\,dy/dx = x^3 \sin 3x + 4$

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

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

$y = 1/3 \cdot \cos 3x + \int 1/3 \cdot \cos 3x + \left(\frac{4x^{-1}}{-1}\right)$

$y = \frac{-x\cos 3x}{3} - \left(\frac{-\sin 3x}{4}\right) - 4x^{-1}$

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

e) $dy/dx + y/x = y^3$

$dy/dx + (1/x)y = y^3$

$z = y^{1-3} = y^{-2}, \; dz/dx = -2 \cdot y^{-3}\,dy/dx$

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

$-2y^{-3}\,dy/dx - (2/x)y^{-2} = -2$

$dz/dx - 2/x\,z = -2$

$I.F = x^{-2}$

$z.I.F = \int Q \cdot I.F\,dx$

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

$\frac{z}{x^2} = \frac{2}{x} + C$

$\frac{z}{x^2} = \frac{2 + xC}{x}$

$z = 2x + x^2C$

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

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

$dy/dx = \dfrac{2y^3}{x^3+xy^2}$

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

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

$x\dfrac{dv}{dx} = \dfrac{2v^3}{1+v^2} - v$

$x\dfrac{dv}{dx} = \dfrac{2v^3-(v(1+v^2))}{1+v^2}$

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

$x \cdot dx = v^3$

$\dfrac{1+v^2}{v^3-v}\cdot dx = \dfrac{1}{x}\cdot dx$

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

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

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

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

$2 = 2B$

$B = 1$

$v = -1$

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

$2 = 2C$

$C = 1$

$v = 0$

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

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

$1 = -A$

$A = -1$

$\int\left(-\dfrac{1}{v} + \dfrac{1}{v-1} + \dfrac{1}{v+1}\right)dv = \int \dfrac{1}{x}\,dx$

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

$\dfrac{v^2-1}{v} = Ax$

$\dfrac{y^2}{x^2} - 1 = Ax - y/x$

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

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

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

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

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