CHARLES CHIMADI...
...012
...AL ENG
ASSIGNMENT 2

$x \, dx$

-3

$nx + c$

$+ 2c$

-2

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

Sub for dz/dx

$$\frac{dz}{dx} - \frac{2}{x} z = -2$$

Let $-\frac{2}{x} = M \quad -2 = N$

$$IF = e^{\int M dx}$$

$$\therefore \int M dx = 2\ln x$$

$$IF = e^{\int -2\ln x} = x^{-2}$$

$$y \cdot IF = \int N \cdot IF \, dx$$

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

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

$$y = 2x^{3} + x^{2}c$$

5) $x^{3}\frac{dy}{dx} = x^{3}\sin 3x + IF$

$$\frac{dy}{dx} = \sin 3x + \frac{1}{x^{3}}$$

$$y = \int \sin 3x + \frac{1}{x^{3}}$$

$$y = -\frac{\cos 3x}{3} - \frac{2}{x^{3}}$$

$$y = -\frac{\cos 3x}{3} - \frac{2}{x^{2}}$$

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

recall, $\frac{dy}{dx} = v + x\frac{dv}{dx}$, and $y = vx$

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

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

$$(1+v^{2})\left(v + \frac{dv}{dx}\right) = 2v^{3}$$

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

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

$70 - - = 70$

Resolving RHS into partial fraction

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

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

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

$$y = vx$$

$$v = y/x$$

$$\ln x = \ln\left[\frac{(\frac{y}{x}-1)(\frac{y}{x}+1)}{y/x}\right] + c$$

$$\ln x = \ln\left(\frac{y^{2}-x^{2}}{x^{2}}\right) + c$$

$$\ln x - \ln\left(\frac{y^{2}-x^{2}}{x^{2}}\right) = \ln A$$

$$\ln \frac{x(x^{2})}{y^{2}-x^{2}} = \ln A$$

$$\frac{x^{3}}{y^{2}-x^{2}} = A$$

$$A(y^{2}-x^{2}) = x^{3}$$

$$y^{2} - x^{2} = \frac{x^{3}}{A}$$

$$y^{2} = \frac{x^{3}}{A} + x^{2}$$

$$y = \sqrt{\frac{x^{3} + Ax^{2}}{A}}$$

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>16/ENG05/012
>BIOMEDICAL ENG
>ENG282 ASSIGNMENT2

1) $\frac{dy}{dx} + y\tanh x = 2\sinh x$

$P = \tanh x \quad Q = 2\sinh x$

$IF = e^{\sinh x}$

$\int P\,dx = \int \tanh x\,dx$

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

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

$u = \cosh x$

$\frac{du}{dx} = \sinh x$

$dx = \frac{du}{\sinh x}$

$= \int \frac{1}{u}\,dx$

$= \ln u$

$= \ln(\cosh x)$

$IF = e^{\ln\cosh} = \cosh x$

$y \cdot I = \int Q \cdot IF\,dx$

$y\cosh x = \int 2\sinh x \cdot \cosh x\,dx$

$y\cosh x = 2\int \sinh x \cdot \cosh x\,dx$

let $\cosh x = u$

$\frac{du}{dx} = \sinh x$

$dx = \frac{du}{\sinh x}$

$y\cosh x = 2\int \sinh x \cdot u \cdot \frac{du}{\sinh x}$

$y\cosh x = 2\int u\,du$

$y\cosh x = u^2$

$y\cosh x = \cosh^2 x + c$

$y = \cosh x + c/\cosh x$

2) $\frac{dy}{dx} + 2y = e^{3x}$

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

$IF = e^{\int P\,dx}$

$\int P\,dx = \int 2\,dx$

$= 2x$

$IF = e^{2x}$

$y \cdot IF = \int Q \cdot IF\,dx$

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

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

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

$y = \frac{e^{2x}}{5} + \frac{c}{e^{2x}}$

3) $x\frac{dy}{dx} = x^2 + 2x - 3$

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

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

$y = x^2 + 4x - 6\ln x + 2c$

4) $\frac{dy}{dx} + y/x = y'$

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

Let $y^{-2} = z$

$\frac{1}{x} = P \qquad 1 = Q$

$\frac{dz}{dx} = \frac{dz}{dy} \cdot \frac{dy}{dx}$

$= -2y^2 \cdot \frac{dy}{dx}$

multiply through by -2