Instituto Politécnico Nacional

Escuela Superior de Cómputo

EDO lineales de 2do orden

Materia: Ecuaciones Diferenciales

Integrantes:

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Ejercicio 1

Priego Merino Saeed

Ecuacion

$$x\,y'' + y' = 0$$

Ecuacion de la forma:

$$F\left(x,\, y^{(k)},\, y^{(k+1)}, \ldots,\, y^{(n)}\right) = 0$$

con:

$$k = 1,\ n = 2$$

Bajo el orden de la ecuacion de sustitucion:

$$y^{(k)} = u\,(x)$$

Sustitucion:

$$y' = u$$

$$u'\,x + u = 0$$

Calcular:

$$u'\,x + u = 0$$

$$u'\,x = -u$$

$$u' = -\frac{u}{x}$$

$$\frac{\mathrm{d}u}{\mathrm{d}x} = -\frac{u}{x}$$

$$\mathrm{d}u = -\frac{u\,\mathrm{d}x}{x}$$

$$\frac{\mathrm{d}u}{u} = -\frac{\mathrm{d}x}{x}$$

Ecuacion Separable:

$$\int \frac{1}{u}\,\mathrm{d}u = \int -\frac{1}{x}\,\mathrm{d}x$$

$$\ln\,(u) = C - \ln\,(x)$$

$$u = \frac{e^C}{x}$$

$$u = \frac{C}{x}$$

Sustituimos y queda:

$$y' = \frac{C}{x}$$

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{C}{x}$$

$$\mathrm{d}y = \frac{C\,\mathrm{d}x}{x}$$

Ecuacion Separable:

$$\int 1\ \mathrm{d}y = \int \frac{C}{x}\ \mathrm{d}x$$

$$y = C\ \ln{(x)} + C_1$$

Resultado:

$$y = C\ \ln{(x)} + C_1$$

Ejercicio 7

Diaz Torres Jonathan Samuel

Ecuacion

$$y\,y'' + {y'}^2 = 0$$

Ecuacion de la forma:

$$F\left(x,\, y^{(k)},\, y^{(k+1)}, \ldots,\, y^{(n)}\right) = 0$$

Bajo el orden de la ecuacion de sustitucion:

$$y' = u\,(y)$$

Sustitucion:

$$u\,u'\,y + u^2 = 0$$

Calcular:

$$u\,u'\,y + u^2 = 0$$

$$u'\,y + u = 0$$

$$u'\,y = -u$$

$$u' = -\frac{u}{y}$$

$$\frac{\mathrm{d}u}{\mathrm{d}y} = -\frac{u}{y}$$

$$\mathrm{d}u = -\frac{u\,\mathrm{d}y}{y}$$

$$\frac{\mathrm{d}u}{u} = -\frac{\mathrm{d}y}{y}$$

Ecuacion Separable:

$$\int \frac{1}{u}\,\mathrm{d}u = \int -\frac{1}{x}\,\mathrm{d}x$$

$$\ln(u) = C - \ln(x)$$

$$u = \frac{e^C}{x}$$

$$u = \frac{C}{x}$$

Sustituimos y queda:

$$\int \frac{1}{u}\,\mathrm{d}u = \int -\frac{1}{y}\,\mathrm{d}y$$

$$\ln(u) = C - \ln(y)$$

$$u = \frac{e^C}{y}$$

$$u = \frac{C}{y}$$

$$y' = \frac{C}{y}$$

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{C}{y}$$

$$\mathrm{d}y = \frac{C\,\mathrm{d}x}{y}$$

$$y\,\mathrm{d}y = C\,\mathrm{d}x$$

Ecuacion Separable:

$$\int y\ \mathrm{d}y = \int C\ \mathrm{d}x$$

$$\frac{y^2}{2} = C\,x + C_1$$

Resultado:

$$\frac{y^2}{2} = C\,x + C_1$$

Ejercicio 13

Arellano Millan Gabriel

Ecuacion

$$4\,x\,y'' + y' = 0$$

Ecuacion de la forma:

$$F\left(x,\, y^{(k)},\, y^{(k+1)}, \ldots,\, y^{(n)}\right) = 0$$

Bajo el orden de la ecuacion de sustitucion:

$$y^{(k)} = u\,(x)$$

Sustitucion:

$$y' = u$$

Calcular:

$$4\,u'\,x + u = 0$$

$$4\,u'\,x = -u$$

$$u' = -\frac{u}{4\,x}$$

$$\frac{\mathrm{d}u}{\mathrm{d}x} = -\frac{u}{4\,x}$$

$$\mathrm{d}u = -\frac{u\,\mathrm{d}x}{4\,x}$$

$$\frac{\mathrm{d}u}{u} = -\frac{\mathrm{d}x}{4\,x}$$

Ecuacion Separable:

$$\int \frac{1}{u}\,\mathrm{d}u = \int -\frac{1}{4\,x}\,\mathrm{d}x$$

$$\ln(u) = C - \frac{\ln(x)}{4}$$

$$u = \frac{e^C}{\sqrt[4]{x}}$$

$$u = \frac{C}{\sqrt[4]{x}}$$

Sustituimos y queda:

$$y' = \frac{C}{\sqrt[4]{x}}$$

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{C}{\sqrt[4]{x}}$$

$$\mathrm{d}y = \frac{C\,\mathrm{d}x}{\sqrt[4]{x}}$$

Ecuacion Separable:

$$\int 1 \, \mathrm{d}y = \int \frac{C}{\sqrt[4]{x}} \, \mathrm{d}x$$

$$y = \frac{4\,C\,\sqrt[4]{x^3}}{3} + C_1$$

Resultado:

$$y = \frac{4\,C\,\sqrt[4]{x^3}}{3} + C_1$$

Ejercicio 19

Ocaña Castro Hector

Ecuacion

$$y'' = 2\,y\,y'$$

Ecuacion de la forma:

$$F\left(x,\, y^{(k)},\, y^{(k+1)}, \ldots,\, y^{(n)}\right) = 0$$

Bajo el orden de la ecuacion de sustitucion:

$$y' = u\,(y)$$

Sustitucion:

$$u\,u' = 2\,u\,y$$

Calcular:

$$u\,u' = 2\,u\,y$$
$$u' = 2\,y$$
$$\frac{\mathrm{d}u}{\mathrm{d}y} = 2\,y$$
$$\mathrm{d}u = 2\,y\,\mathrm{d}y$$

Ecuacion Separable:

$$\int 1\;\mathrm{d}u = \int 2\,y\;\mathrm{d}y$$
$$u = y^2 + C$$
$$u = y^2 + C,\;\; u = 0$$
$$y' = y^2 + C$$

Sustituimos y queda:

$$\frac{\mathrm{d}y}{\mathrm{d}x} = y^2 + C$$
$$\mathrm{d}y = \left(y^2 + C\right)\;\mathrm{d}x$$
$$\frac{\mathrm{d}y}{y^2 + C} = \mathrm{d}x$$

Ecuacion Separable:

$$\int \frac{1}{y^2 + C}\;\mathrm{d}y = \int 1\;\mathrm{d}x$$
$$\frac{\arctan\left(\frac{y}{\sqrt{C}}\right)}{\sqrt{C}} = x + C_1$$

Resultado:

$$y = C\;\tan\left(C\;(x + C_1)\right)$$

Ejercicio 25

Lopez Chavez Moises , Vazquez Blancas Cesar Said

Ecuacion

$$y\,y'' = {y'}^2$$

Ecuacion de la forma:

$$F\left(x,\, y^{(k)},\, y^{(k+1)}, \dots,\, y^{(n)}\right) = 0$$

Bajo el orden de la ecuacion de sustitucion:

$$y' = u\,(y)$$

Sustitucion:

$$u\,u'\,y = u^2$$

Calcular:

$$u\,u'\,y = u^2$$
$$u'\,y = u$$
$$u' = \frac{u}{y}$$
$$\frac{\mathrm{d}u}{\mathrm{d}y} = \frac{u}{y}$$
$$\mathrm{d}u = \frac{u\,\mathrm{d}y}{y}$$
$$\frac{\mathrm{d}u}{u} = \frac{\mathrm{d}y}{y}$$

Ecuacion Separable:

$$\int \frac{1}{u}\,\mathrm{d}u = \int \frac{1}{y}\,\mathrm{d}y$$
$$\ln(u) = \ln(y) + C$$
$$u = e^C\,y$$
$$u = C\,y$$

Sustituimos y queda:

$$y' = C\,y$$
$$\frac{\mathrm{d}y}{\mathrm{d}x} = C\,y$$
$$\mathrm{d}y = C\,y\,\mathrm{d}x$$
$$\frac{\mathrm{d}y}{y} = C\,\mathrm{d}x$$

Ecuacion Separable:

$$\int \frac{1}{y}\,\mathrm{d}y = \int C\,\mathrm{d}x$$
$$\ln(y) = C\,x + C_2$$

Resultado:

$$y = C_2\,e^{C\,x}$$