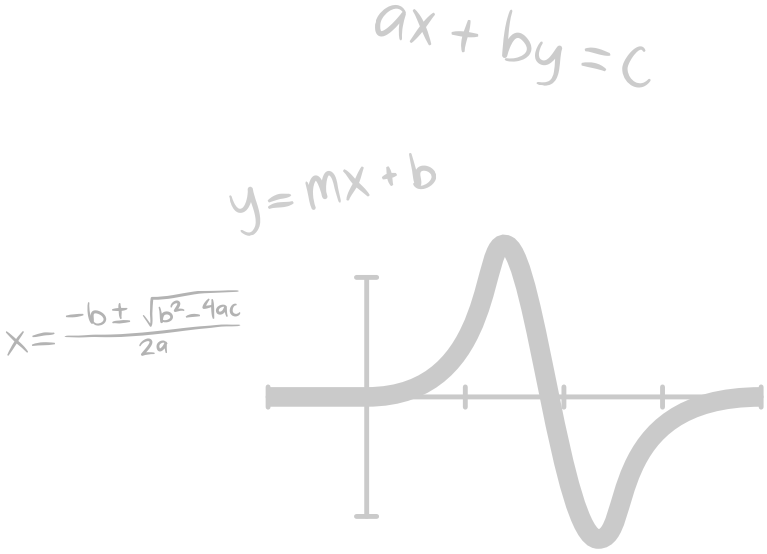
Wolfram Mathematica 9

Practical File



ORDINARY DIFFERENTIAL EQUATIONS

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Bachelor of Science in Mathematics (Honours)

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INDEX

S.No	Practical Name	Page No.	Signature

06, March, 2024

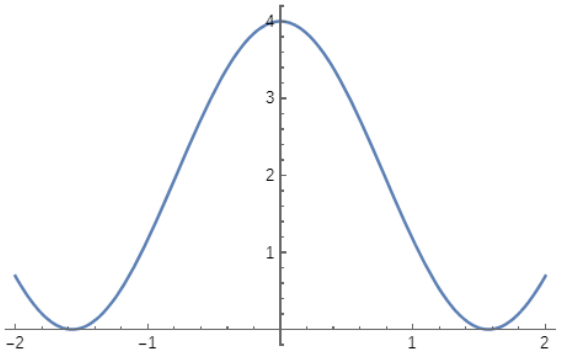
Practical – 01

Question 1: Solve the first, second, and third-order differential equation.

i. y' tan (x) = 2 y - 8 y (pi / 2) = 0 & plot for x belong to (-2, 2)

In[3]:=
```
S1 = DSolve[{Y'[X] * Tan[X] == 2 * Y[X] - 8, Y[Pi / 2] == 0}, Y[X], X]
```
Out[3]= $\{\{Y[X] \to -4\,(-1+\text{Sin}[X]^2)\}\}$

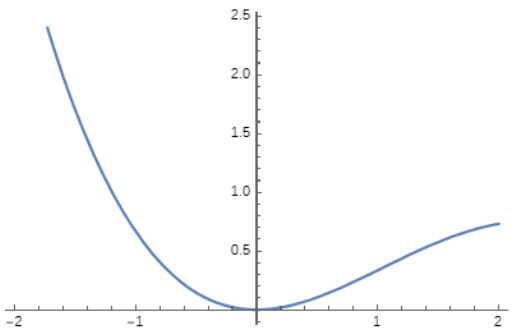
In[4]:=
```
Plot[Y[X] /. S1, {X, -2, 2}]
```
Out[4]=



ii. y' + y = sin (x) y (0) = 0 & plot for x belong to (-2, 2)

In[5]:=
```
S2 = DSolve[{y'[x] + y[x] == Sin[x], y[0] == 0}, y[x], x]
```
Out[5]= $\left\{\left\{y[x] \to -\frac{1}{2}e^{-x}\,(-1+e^{x}\,\text{Cos}[x]-e^{x}\,\text{Sin}[x])\right\}\right\}$

In[6]:=
```
Plot[y[x] /. S2, {x, -2, 2}]
```
Out[6]=



06, March, 2024

Practical – 02

Question 2: Plotting of family of solution of differential equation of I, II, and III order.

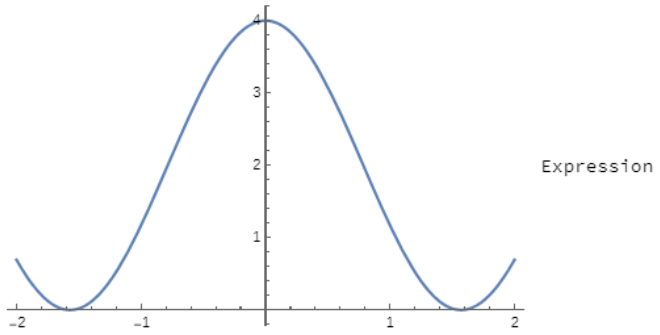
i. y' tan (x) = 2 y - 8 & plot family of curves obtained over(-2, 2)

In[7]:=
```
Sol = DSolve[{Y'[X] * Tan[X] == 2 * Y[X] - 8, Y[Pi / 2] == 0}, Y[X], X]
```

Out[7]= $\{\{Y[X] \to -4\,(-1+\text{Sin}[X]^2)\}\}$

In[8]:=
```
Plot[Evaluate[Y[X] /. Sol /. C[1] → {-1, 1}], {X, -2, 2}, PlotLegends → "Expression"]
```

Out[8]=



ii. Solve y'' + 7 y' + 12 y = 0 & plot family of curves obtained over(-2, 2)

In[9]:=
```
Sol2 = DSolve[y''[x] + 7 * y'[x] + 12 * y[x] == 0, y[x], x]
```

Out[9]= $\{\{y[x] \to e^{-4x} C_1 + e^{-3x} C_2\}\}$

In[11]:=
```
eval = Evaluate[y[x] /. Sol2 /. C[1] → {-1, 1} /. C[2] → {-1, 1}]
Plot[eval, {x, -2, 2}, PlotLegends → "Expressions"]
```

Out[11]= $\{\{\{-e^{-4x}-e^{-3x}, -e^{-4x}+e^{-3x}\}, \{e^{-4x}-e^{-3x}, e^{-4x}+e^{-3x}\}\}\}$

Out[12]=