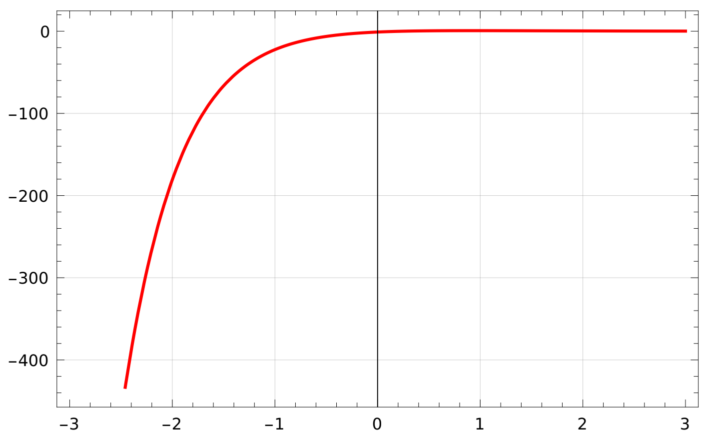
MOCK PRACTICAL

Q1.Solve second order differential equation 4 +12 +9y=0 and plot its two solutions
(i) C[1]=-1,C[2]=4
(ii) C[1]=3,C[2]=6

In[67]:=
```
sol1 = DSolve[4 * y''[x] + 12 * y'[x] + 9 * y[x] == 0, y[x], x]
```
Out[67]= $\{\{y[x] \to e^{-3x/2} c_1 + e^{-3x/2} x\, c_2\}\}$

In[70]:=
```
sol = y[x] /. sol1[[1]] /. {C[1] → -1, C[2] → 4}
```
Out[70]= $-e^{-3x/2} + 4 e^{-3x/2} x$

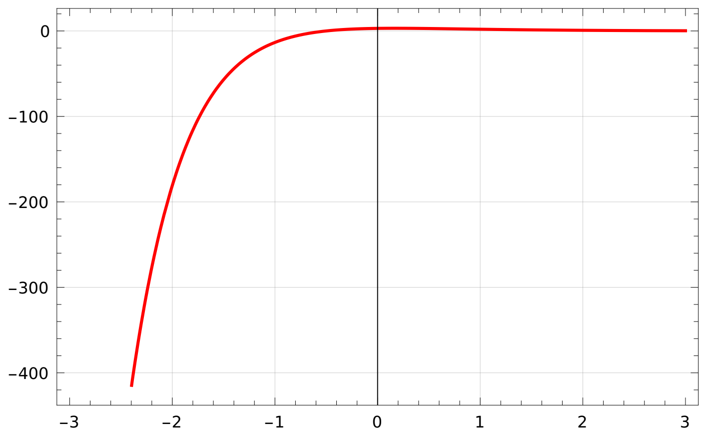
In[71]:=
```
Plot[{sol}, {x, -3, 3}, PlotStyle → Red,
 Frame → True, AxesOrigin → {0, 0}, GridLines → Automatic]
```
Out[71]=



In[72]:=
```
sol = y[x] /. sol1[[1]] /. {C[1] → 3, C[2] → 6}
```
Out[72]= $3 e^{-3x/2} + 6 e^{-3x/2} x$

In[73]:=
```
Plot[{sol}, {x, -3, 3}, PlotStyle → Red,
 Frame → True, AxesOrigin → {0, 0}, GridLines → Automatic]
```

Out[73]=



Q2.Use the method of variation of parameters to solve the non-homogeneous ordinary
differential equation: y''+y =tanx

In[74]:=
```
sol = DSolve[y''[x] + y[x] == 0, y[x], x]
```

Out[74]= $\{\{y[x] \to c_1 \, \mathrm{Cos}[x] + c_2 \, \mathrm{Sin}[x]\}\}$

In[75]:=
```
y1 := Cos[x];
```

In[76]:=
```
y2 := Sin[x];
```

In[77]:=
```
f := Tan[ x];
```

In[78]:=
```
w = y1 * D[y2, x] - y2 * D[y1, x];
```

In[79]:=
```
w = Simplify [w]
```

Out[79]= 1

In[80]:=
```
yp = - y1 * Integrate [y2 * (f / w), x] + y2 * Integrate [y1 * (f / w), x];
```

In[81]:=
```
yp = Simplify [yp]
```

Out[81]= $\mathrm{Cos}[x]\left(\mathrm{Log}\left[\mathrm{Cos}\left[\frac{x}{2}\right]-\mathrm{Sin}\left[\frac{x}{2}\right]\right]-\mathrm{Log}\left[\mathrm{Cos}\left[\frac{x}{2}\right]+\mathrm{Sin}\left[\frac{x}{2}\right]\right]\right)$

In[82]:=
```
Out[74] + Out[81]
```

Out[82]= $\left\{\left\{\mathrm{Cos}[x]\left(\mathrm{Log}\left[\mathrm{Cos}\left[\frac{x}{2}\right]-\mathrm{Sin}\left[\frac{x}{2}\right]\right]-\mathrm{Log}\left[\mathrm{Cos}\left[\frac{x}{2}\right]+\mathrm{Sin}\left[\frac{x}{2}\right]\right]\right)+(y[x] \to c_1 \, \mathrm{Cos}[x] + c_2 \, \mathrm{Sin}[x])\right\}\right\}$

Q3.Obtain the solution of the equation:
2ux+3uy=0 given u(x,0)=sinx

In[83]:=
```
Eqn := 2 * D[u[x, y], x] + 3 * D[u[x, y], y] == 0;
```

In[84]:=
```
Sol3 = DSolve[{Eqn, u[x, 0] == Sin[x]}, u[x, y], {x, y}]
```

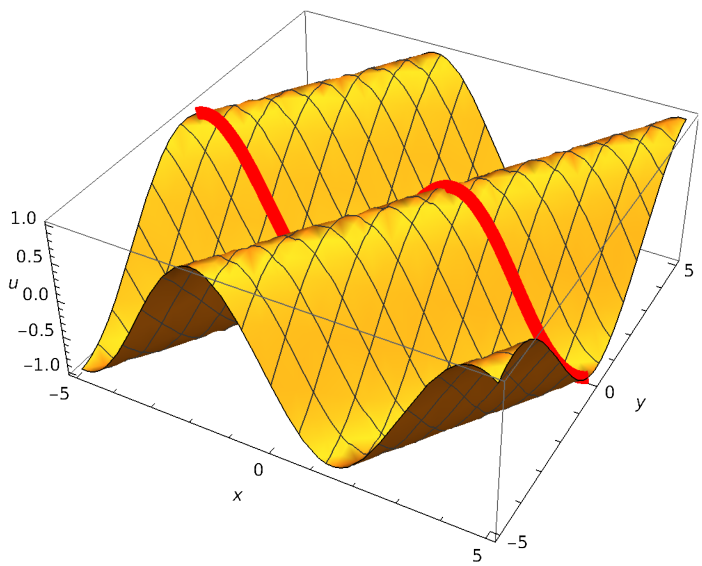
Out[84]= $\left\{\left\{u[x, y] \to \text{Sin}\left[\frac{1}{3}(3x - 2y)\right]\right\}\right\}$

In[85]:=
```
p1 = Plot3D[u[x, y] /. Sol3, {x, -5, 5}, {y, -5, 5}, AxesLabel → {x, y, u}];
```

In[86]:=
```
p2 = ParametricPlot3D [{x, 0, Sin[x]}, {x, -5, 5}, PlotStyle → {Red, Thickness [0.02]}];
```

In[87]:=
```
Show[p1, p2]
```

Out[87]=



In[88]:=
```
Soln1 = DSolve[2 * y '[x] - 3 == 0, y[x], x](*Characteristic Equation*)
```

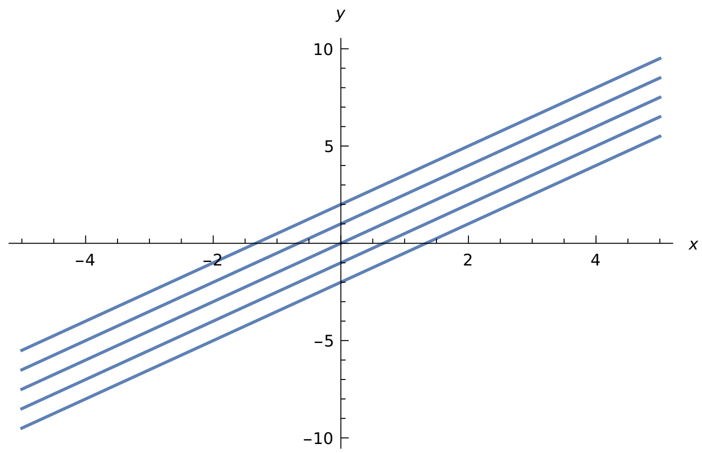
Out[88]= $\left\{\left\{y[x] \to \frac{3x}{2} + c_1\right\}\right\}$

In[89]:=
```
Par = y[x] /. Soln1 /. C[1] → {-2, -1, 0, 1, 2}
```

Out[89]= $\left\{\left\{-2 + \frac{3x}{2}, -1 + \frac{3x}{2}, \frac{3x}{2}, 1 + \frac{3x}{2}, 2 + \frac{3x}{2}\right\}\right\}$

In[90]:=
```
Plot[Par, {x, -5, 5}, AxesLabel → {x, y}]
```

Out[90]=



Q4. extra attempt

In[91]:=
```
a[u_, x_, y_] := x
```

In[99]:=
```
b[u_, x_, y_] := y[x]
```

In[100]:=
```
sol = DSolve[y'[x] == b[u, x, y] / a[u, x, y], y[x], x]
```

Out[100]= $\{\{y[x] \to x\, c_1\}\}$

In[102]:=
```
tab1 = Table[y[x] /. sol[[1, 1]] /. C[1] → i, {i, -2, 2}]
Plot[{Evaluate[tab1]}, {x, -10, 10}, PlotLegends → "Expressions"]
```

Out[102]= $\{-2x, -x, 0, x, 2x\}$

Out[103]=