

Practical-6

To solve cauchy problem for first order partial differential equation

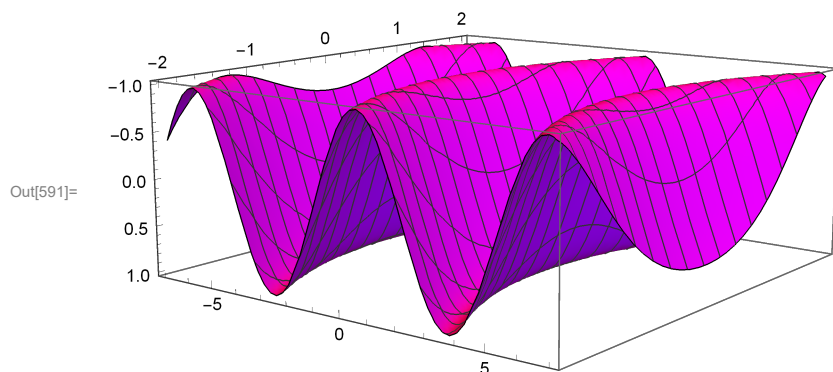
```
In[584]:= p := D[u[x, y], x]
          q := D[u[x, y], y]
```

Question 1:

```
In[589]:= eqn1 = p + x * q == 0
sol1 = u[x, y] /. DSolve[{eqn1, u[0, y] == Sin[y]}, u[x, y], {x, y}]
Plot3D[sol1, {x, -2, 2}, {y, -7, 7}, PlotPoints -> 30, PlotStyle -> {Magenta}]
```

```
Out[589]= x u(0,1)[x, y] + u(1,0)[x, y] == 0
```

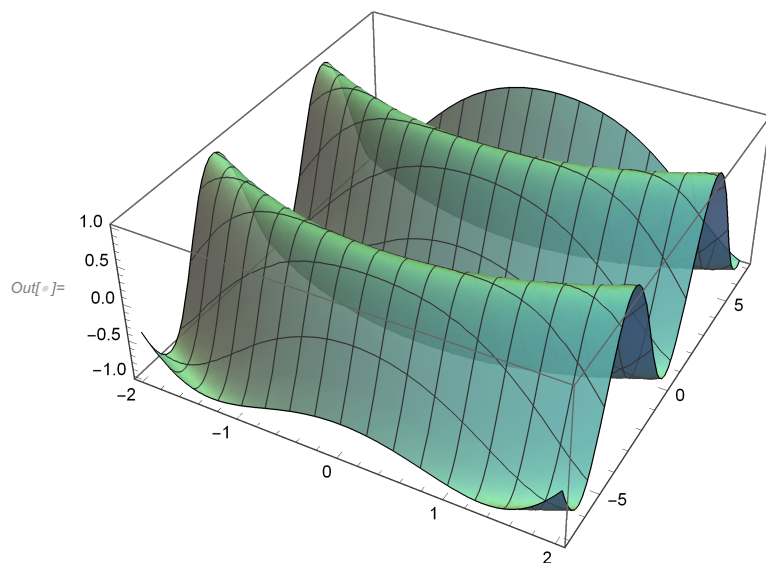
```
Out[590]= {Sin[ $\frac{1}{2}(-x^2 + 2y)$ ] }
```



```

In[ ]:= Plot3D[sol1, {x, -2, 2}, {y, -7, 7},
  PlotStyle → Directive[RGBColor[0.5, 1., 0.82], Opacity[0.866]], PlotPoints → 30]

```



Question 2:

```

In[ ]:=
eqn2 = p + Sin[x] * q == 0
sol2 = u[x, y] /. DSolve[{eqn2, u[0, y] == y}, u[x, y], {x, y}]

```

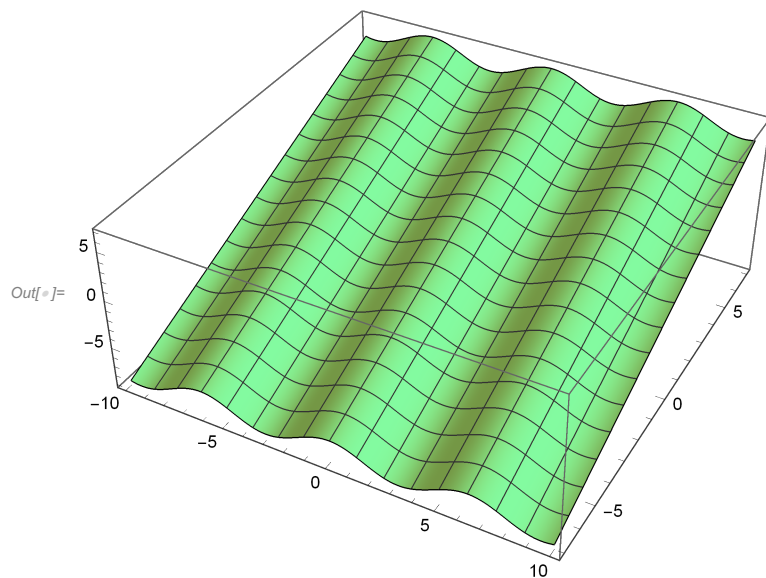
Out[]:= $\sin[x] u^{(0,1)}[x, y] + u^{(1,0)}[x, y] == 0$

Out[]:= $\{-1 + y + \cos[x]\}$

```

In[ ]:= Plot3D[sol2, {x, -10, 10}, {y, -7, 7}, PlotStyle → RGBColor[0.5, 1., 0.68], PlotPoints → 200]

```



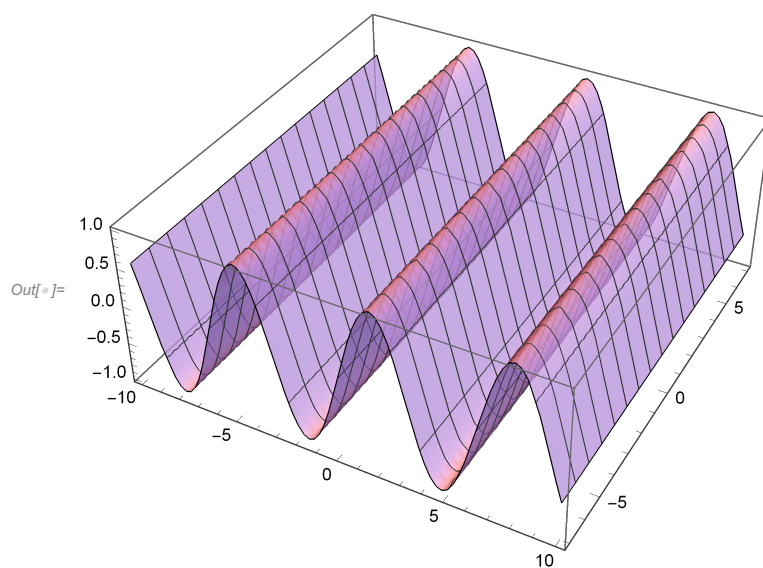
Question 3:

```
In[ ]:= eqn3 = y * p + x * q == 0
sol3 = u[x, y] /. DSolve[{eqn2, u[0, y] == Sin[x]}, u[x, y], {x, y}]
```

```
Out[ ]:= x u(0,1)[x, y] + y u(1,0)[x, y] == 0
```

```
Out[ ]:= {Sin[x]}
```

```
In[ ]:= Plot3D[sol3, {x, -10, 10}, {y, -7, 7},
PlotStyle -> Directive[RGBColor[1., 0.67, 0.93], Opacity[0.718]], PlotPoints -> 20]
```



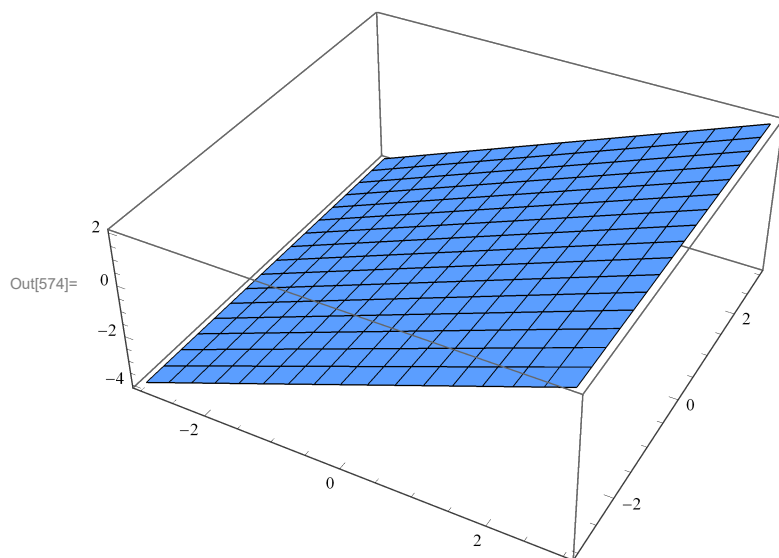
Question 4:

```
In[571]:= eqn1 := x * D[u[x, y], x] + y * D[u[x, y], y] - u[x, y] - 1 == 0
sol1 = DSolve[eqn1, u[x, y], {x, y}]
part1 = u[x, y] /. sol1 /. C[1][y/x] -> 1
```

```
Out[572]= {{u[x, y] -> -1 + x C[1][y/x]}}
```

```
Out[573]= {-1 + x}
```

```
In[574]:= Plot3D[part1, {x, -3, 3}, {y, -3, 3}, PlotTheme -> "Classic"]
```



Question 5:

In[]:=

```
eqn1 := 3 * D[u[x, y], x] - 2 * D[u[x, y], y] == 0
```

```
sol1 = DSolve[eqn1, u[x, y], {x, y}]
```

```
part1 = u[x, y] /. sol1 /. C[1] [  $\frac{1}{3} (2 x + 3 y)$  ]  $\rightarrow \pi$ 
```

```
Plot3D[part1, {x, -3, 3}, {y, -3, 3}, PlotLegends  $\rightarrow$  {x, y, z}, PlotStyle  $\rightarrow$  {Thick[9]}]
```

Out[]:= $\left\{ \left\{ u[x, y] \rightarrow c_1 \left[\frac{1}{3} (2 x + 3 y) \right] \right\} \right\}$

Out[]:= $\{\pi\}$

