

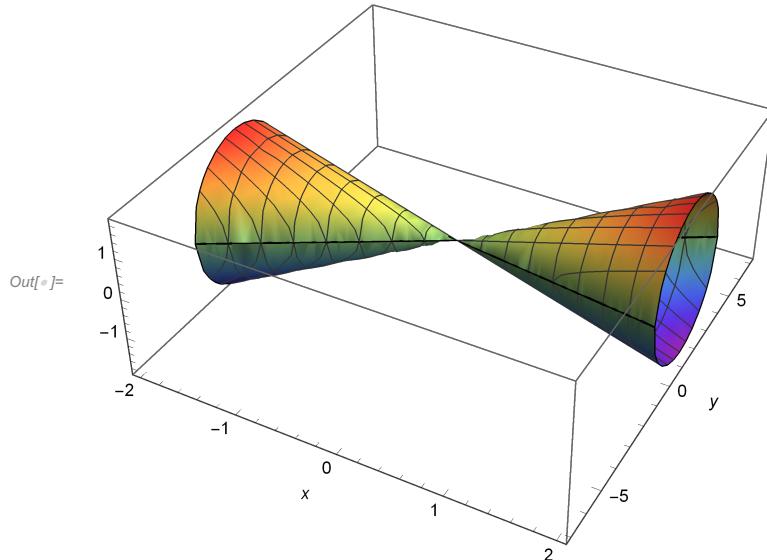
PRACTICAL 8
Plotting the integral surface of first order PDE with initial data

```
pde1 = u[x, y] (x + y) D[u[x, y], x] + u[x, y] (x - y) * D[u[x, y], y] == x^2 + y^2
Out[=] (x - y) u[x, y] u^(0,1)[x, y] + (x + y) u[x, y] u^(1,0)[x, y] == x^2 + y^2
```

```
sol1 = DSolve[{pde1, u[x, 2 x] == 0}, u[x, y], {x, y}]
```

```
Out[=] {u[x, y] → -Sqrt[2/7 (2 x^2 + 3 x y - 2 y^2)], u[x, y] → Sqrt[2/7 (2 x^2 + 3 x y - 2 y^2)],
{u[x, y] → -Sqrt[2/7 (2 x^2 + 3 x y - 2 y^2)], u[x, y] → Sqrt[2/7 (2 x^2 + 3 x y - 2 y^2)]}}
```

```
Plot3D[u[x, y] /. sol1, {x, -2, 2}, {y, -7, 7},
AxesLabel → Automatic, ColorFunction → "Rainbow"]
```

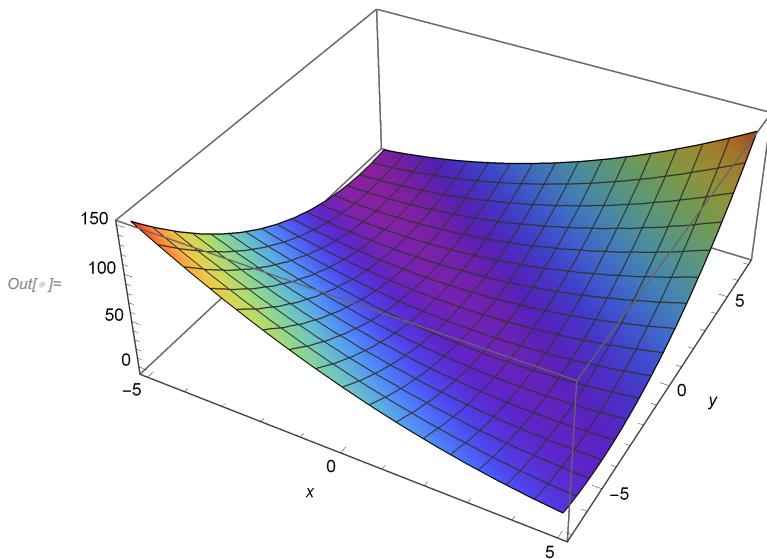


```
pde1 = D[u[x, y], x] - D[u[x, y], y] == 1
Out[=] -u^(0,1)[x, y] + u^(1,0)[x, y] == 1
```

```
sol1 = DSolve[{pde1, u[x, 0] == x^2}, u[x, y], {x, y}]
```

```
Out[=] {u[x, y] → x^2 - y + 2 x y + y^2}
```

```
Plot3D[u[x, y] /. sol1, {x, -5, 5}, {y, -7, 7},
AxesLabel → Automatic, ColorFunction → "Rainbow"]
```



```
pde1 = x D[u[x, y], x] + y D[u[x, y], y] == x Exp[-u[x, y]]
```

Out[=]

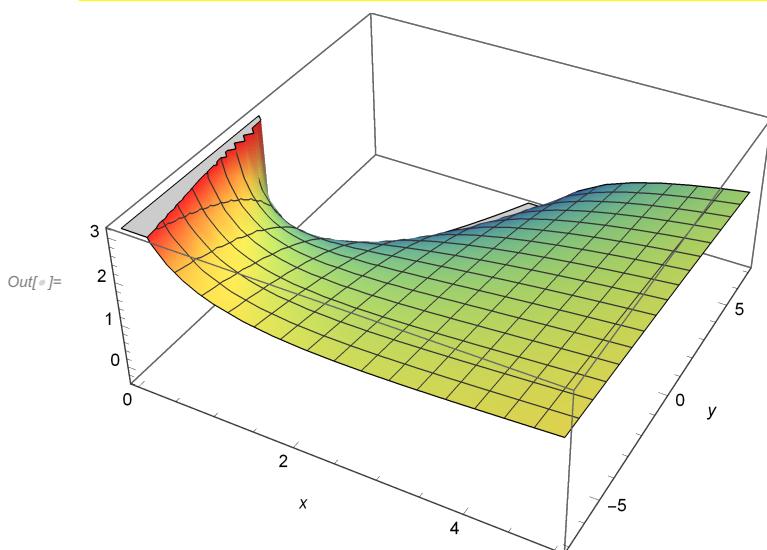
$$y u^{(0,1)}[x, y] + x u^{(1,0)}[x, y] == e^{-u[x, y]} x$$

```
sol1 = DSolve[{pde1, u[x, x^2] == 0}, u[x, y], {x, y}]
```

Out[=]

$$\left\{ \left\{ u[x, y] \rightarrow \text{Log}\left[1 + x - \frac{y}{x}\right] \right\} \right\}$$

```
Plot3D[u[x, y] /. sol1, {x, 0, 5}, {y, -7, 7},
AxesLabel → Automatic, ColorFunction → "Rainbow"]
```



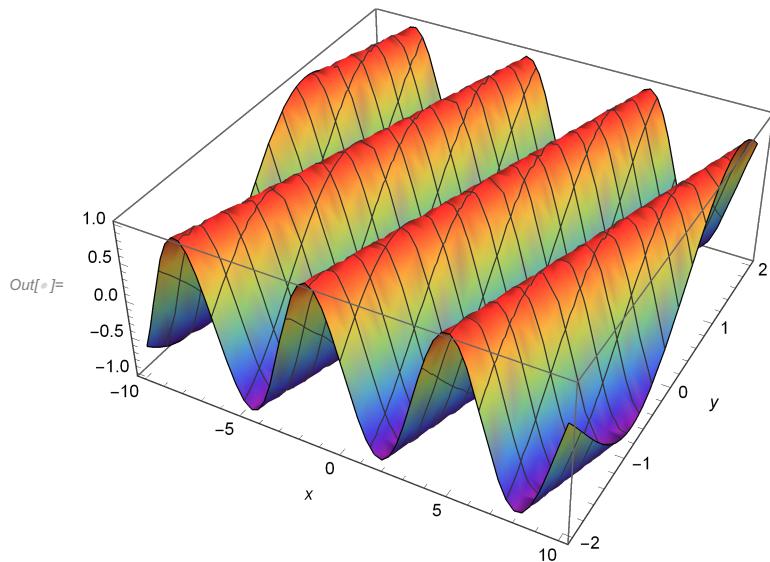
```
pde1 = 3 D[u[x, y], x] + 2 D[u[x, y], y] == 0
```

```
Out[=]= 2 u^(0,1) [x, y] + 3 u^(1,0) [x, y] == 0
```

```
sol1 = DSolve[{pde1, u[x, 0] == Sin[x]}, u[x, y], {x, y}]
```

```
Out[=]= {u[x, y] \rightarrow Sin[\frac{1}{2} (2 x - 3 y)]}
```

```
Plot3D[u[x, y] /. sol1, {x, -10, 10}, {y, -2, 2},
AxesLabel \rightarrow Automatic, ColorFunction \rightarrow "Rainbow"]
```

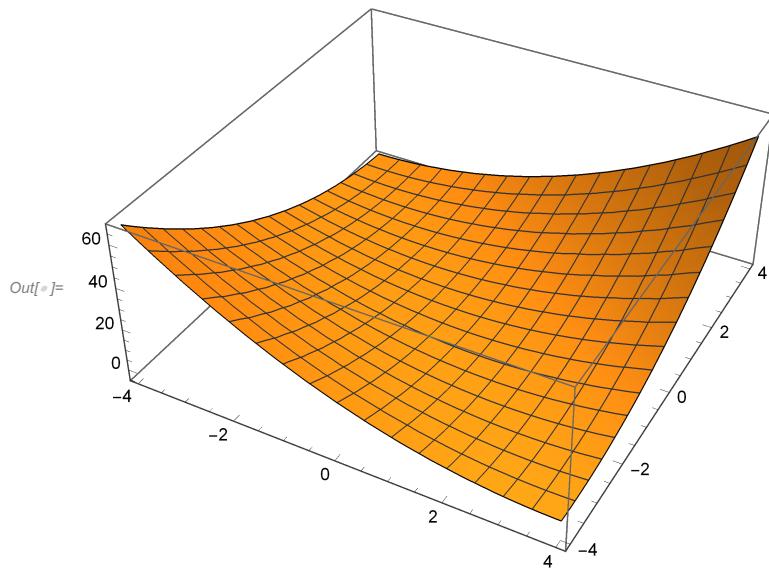


$ux - uy = 1, u(x, 0) = x^2$

```
sol = DSolve[{D[u[x, y], x] - D[u[x, y], y] == 1, u[x, 0] == x^2}, u[x, y], {x, y}]
```

```
Out[=]= {u[x, y] \rightarrow x^2 - y + 2 x y + y^2}
```

```
Plot3D[u[x, y] /. sol, {x, -4, 4}, {y, -4, 4}]
```



$$3 ux + 2 uy = 0, u(x, 0) = \sin x$$

```
sol =
DSolve[{3 D[u[x, y], x] + 2 D[u[x, y], y] == 0, u[x, 0] == Sin[x]}, u[x, y], {x, y}]
```

Out[\circ] =

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

```
Plot3D[u[x, y] /. sol, {x, -5, 5}, {y, -5, 5}]
```

