

7/01/20

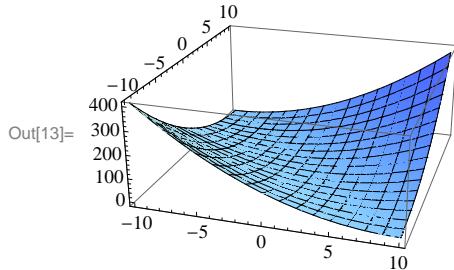
PRACTICAL - 1

SOLVING PARTIAL DIFFERENTIAL EQUATIONS

Q1. $u_x - u_y = 1$ with condition $u[x, 0] = x^2$

```
In[12]:= k = DSolve[{D[u[x, y], x] - D[u[x, y], y] == 1, u[x, 0] == x^2}, u[x, y], {x, y}]  
Plot3D[u[x, y] /. k, {x, -10, 10}, {y, -10, 10}]
```

```
Out[12]= {u[x, y] \rightarrow x^2 - y + 2 x y + y^2}
```

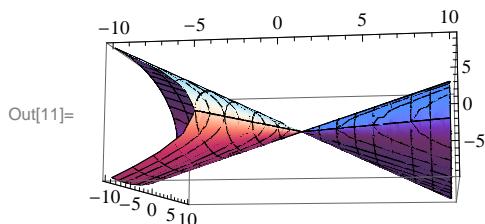


Q2. $u(x+y) u_x + u(x-y) u_y = x^2 + y^2$ with condition $u[x, 2x] = 0$

```
In[10]:= m = DSolve[{u[x, y] (x+y) D[u[x, y], x] + u[x, y] (x-y) D[u[x, y], y] == x^2 + y^2,  
u[x, 2x] == 0}, u[x, y], {x, y}] // Quiet
```

```
Plot3D[u[x, y] /. m, {x, -10, 10}, {y, -10, 10}]
```

```
Out[10]= {u[x, y] \rightarrow -\sqrt{\frac{2}{7}} \sqrt{2 x^2 + 3 x y - 2 y^2}, u[x, y] \rightarrow \sqrt{\frac{2}{7}} \sqrt{2 x^2 + 3 x y - 2 y^2},  
{u[x, y] \rightarrow -\sqrt{\frac{2}{7}} \sqrt{2 x^2 + 3 x y - 2 y^2}, u[x, y] \rightarrow \sqrt{\frac{2}{7}} \sqrt{2 x^2 + 3 x y - 2 y^2}}}
```



Q3. $(y-u) u_x + (u-x) u_y = x - y$, $u = 0$ on $xy = 1$

```
In[5]:= DSolve[{\{ (y - u[x, y]) D[u[x, y], x] + (u[x, y] - x) D[u[x, y], y] == x - y, u[x, \frac{1}{x}] == 0\}, {u[x, y], {x, y}}] // Quiet
```

```
Out[5]= DSolve[{\{ (-x + u[x, y]) u^{(0,1)}[x, y] + (y - u[x, y]) u^{(1,0)}[x, y] == x - y, u[x, \frac{1}{x}] == 0\}, {u[x, y], {x, y}}]
```

Q4. $y u_x + x u_y = u$, $u(x, 0) = x^3$ on $u(0, y) = y^3$

```
In[17]:= DSolve[{\{y D[u[x, y], x] + x D[u[x, y], y] == u[x, y], u[x, 0] == x^3, u[0, y] == y^3\}, {u[x, y], {x, y}}]
```

```
Out[17]= DSolve[{\{x u^{(0,1)}[x, y] + y u^{(1,0)}[x, y] == u[x, y], u[x, 0] == x^3, u[0, y] == y^3\}, {u[x, y], {x, y}}]
```