Contour Plots

```
print("Week 06")
```

```
    Week 06
```

```
# import the libraries
import numpy as np
import matplotlib.pyplot as plt
```

1D contour plots(Line plots)

```
#Generate the data
x = np.linspace(0, 10, 100)
y = np.sin(x)
```

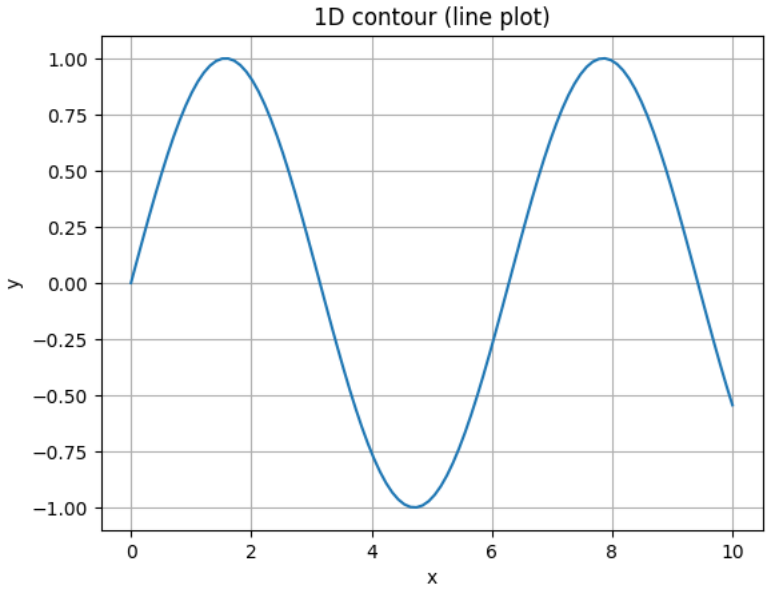
```
# check the shape of the variables
x.shape
```

```
    (100,)
```

```
y.shape
```

```
    (100,)
```

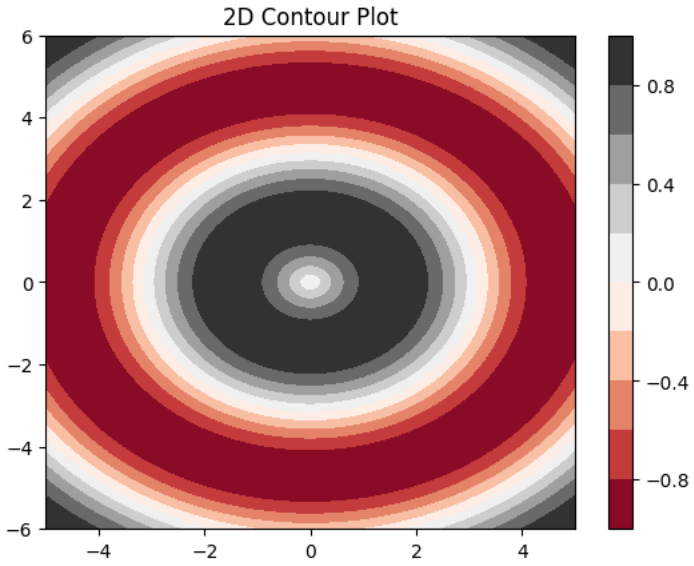
```
# visualization
plt.plot(x,y) # plot
plt.xlabel("x")
plt.ylabel("y")
plt.title("1D contour (line plot)")
plt.grid()
plt.show()
```



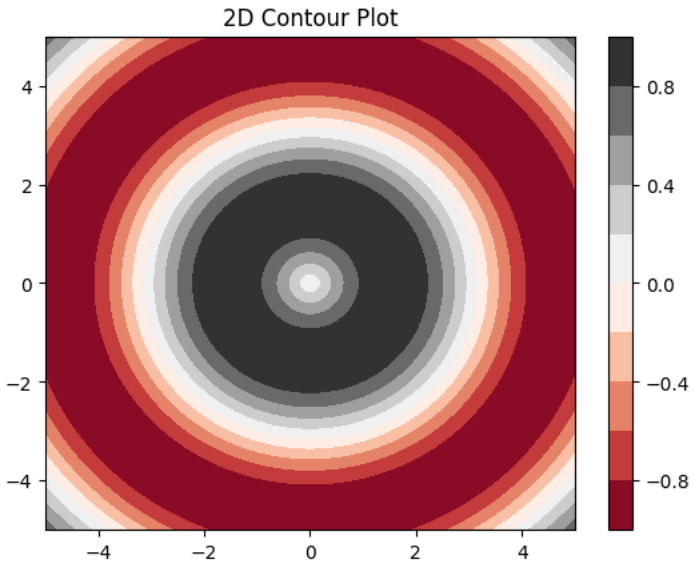
2D contour plots

```
# Generate data
x = np.linspace(-5, 5, 500)
y = np.linspace(-6, 6, 600)

X, Y = np.meshgrid(x, y)
Z = np.sin(np.sqrt(X**2 + Y**2))

# Contour plot
plt.contourf(X, Y, Z, 10, cmap='RdGy')
```

```
plt.colorbar()
plt.title("2D Contour Plot")
plt.show()
```



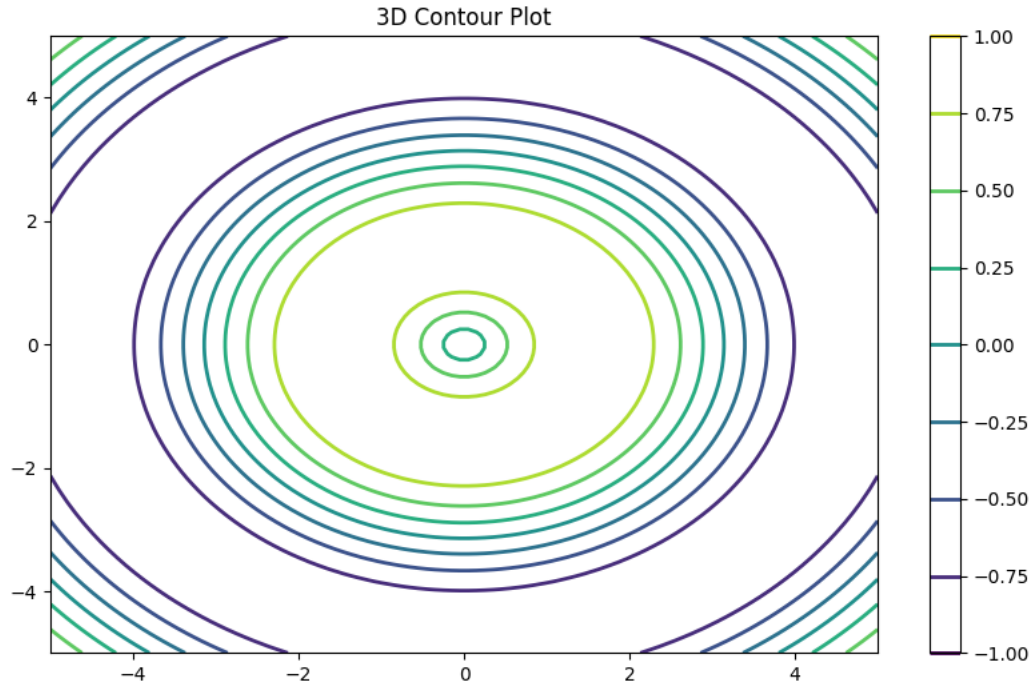

```
# Generate data
x = np.linspace(-5, 5, 500)  # interval is -5 to 5
y = np.linspace(-5, 5, 500) # interval is -5 to 5

X, Y = np.meshgrid(x, y)
Z = np.sin(np.sqrt(X**2 + Y**2))

# Contour plot
plt.contourf(X, Y, Z, 10, cmap='RdGy')
plt.colorbar()
plt.title("2D Contour Plot")
plt.show()
```



3D contour plots

```
import numpy as np
import matplotlib.pyplot as plt

# Generate data
x = np.linspace(-5, 5, 100)
y = np.linspace(-5, 5, 100)
X, Y = np.meshgrid(x, y)
```

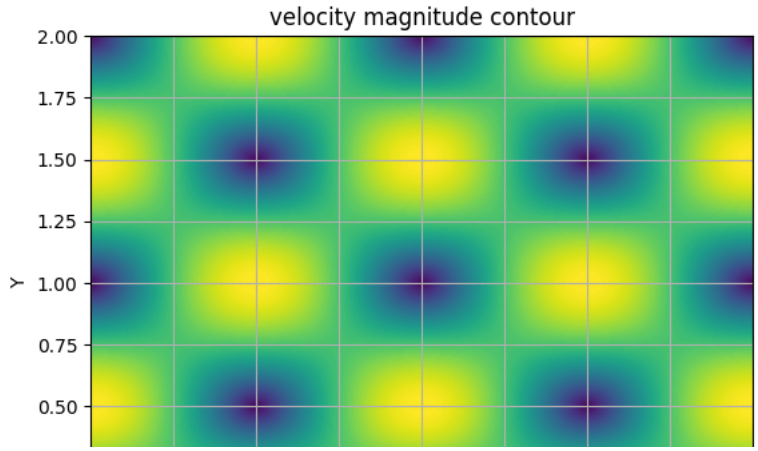
```
Z = np.sin(np.sqrt(X**2 + Y**2))

# Create a 2D contour plot
fig, ax = plt.subplots(figsize=(10,6))
contour = ax.contour(X, Y, Z, cmap="viridis", linewidths=2)
ax.set_title("3D Contour Plot")
plt.colorbar(contour)

plt.show()
```



PYTHON CODE FOR VELOCITY MAGNITUDE & PRESSURE CONTOURS

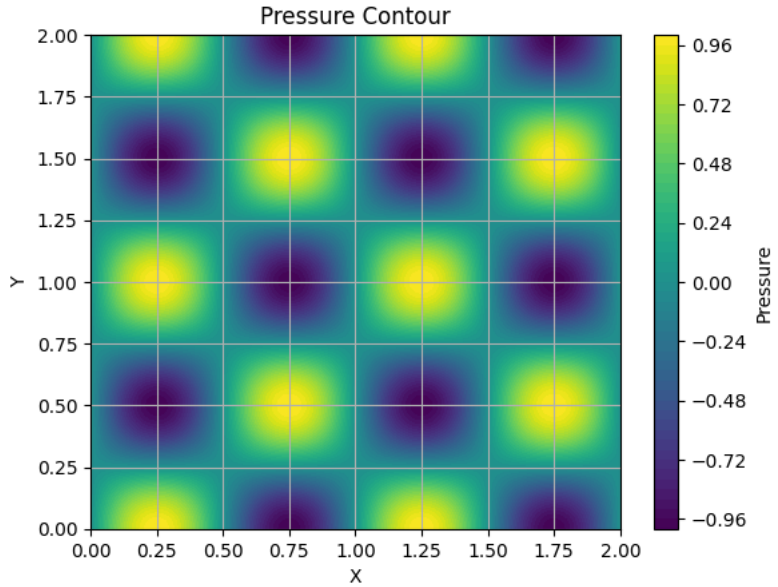
```
# Generate data

nx = 200
ny = 200

x = np.linspace(0, 2, nx) # nx is the number of subdivision
y = np.linspace(0, 2, ny) # ny is the number of subdivision
X, Y = np.meshgrid(x, y)

# say u, v, p

# velocity
u= np.sin(np.pi * X) * np.cos(np.pi *Y)
v= -np.cos(np.pi *X) * np.sin(np.pi * Y)

P = np.sin(2*np.pi * X) * np.cos(2*np.pi *Y)

# First contour plot of velocity magnitude
velocity_mag = np.sqrt(u**2 + v**2)

plt.contourf(X,Y, velocity_mag, 100, camp ='viridis')
plt.title('velocity magnitude contour')
plt.xlabel('X')
plt.ylabel('Y')
plt.grid()
plt.show()
```

```
<ipython-input-11-f30da6aa4e21>:21: UserWarning:

The following kwargs were not used by contour: 'camp'
```



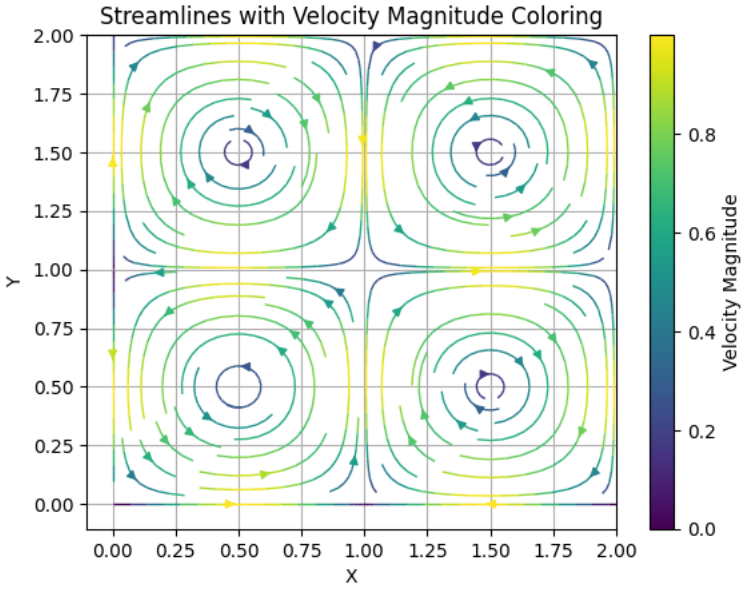
Pressure contour

```
# Pressure magnitude contour
# number of levels = 50
plt.contourf(X, Y, P, 50, cmap='viridis')
plt.colorbar(label="Pressure")
plt.title("Pressure Contour")
plt.xlabel("X")
plt.ylabel("Y")
plt.grid()
plt.show()
```



Streamlines plots

```
#StreamLines
plt.streamplot(X, Y, u, v, density=1, linewidth=1, color=velocity_mag, cmap='viridis')
# colorbar regarding Velocity Magnitude
plt.colorbar(label="Velocity Magnitude")

plt.title("Streamlines with Velocity Magnitude Coloring")

plt.xlabel("X")
plt.ylabel("Y")

plt.grid()
plt.show()
```



Velocity vector field

```
# Vector field
# Your task is to know about quiver and the line below
plt.quiver(X[::5, ::5], Y[::5, ::5], u[::5, ::5], v[::5, ::5], scale=20)
plt.title("Velocity Vector Field")
plt.xlabel("X")
plt.ylabel("Y")
plt.grid(True)
plt.show()
```