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La Normal Multivariada

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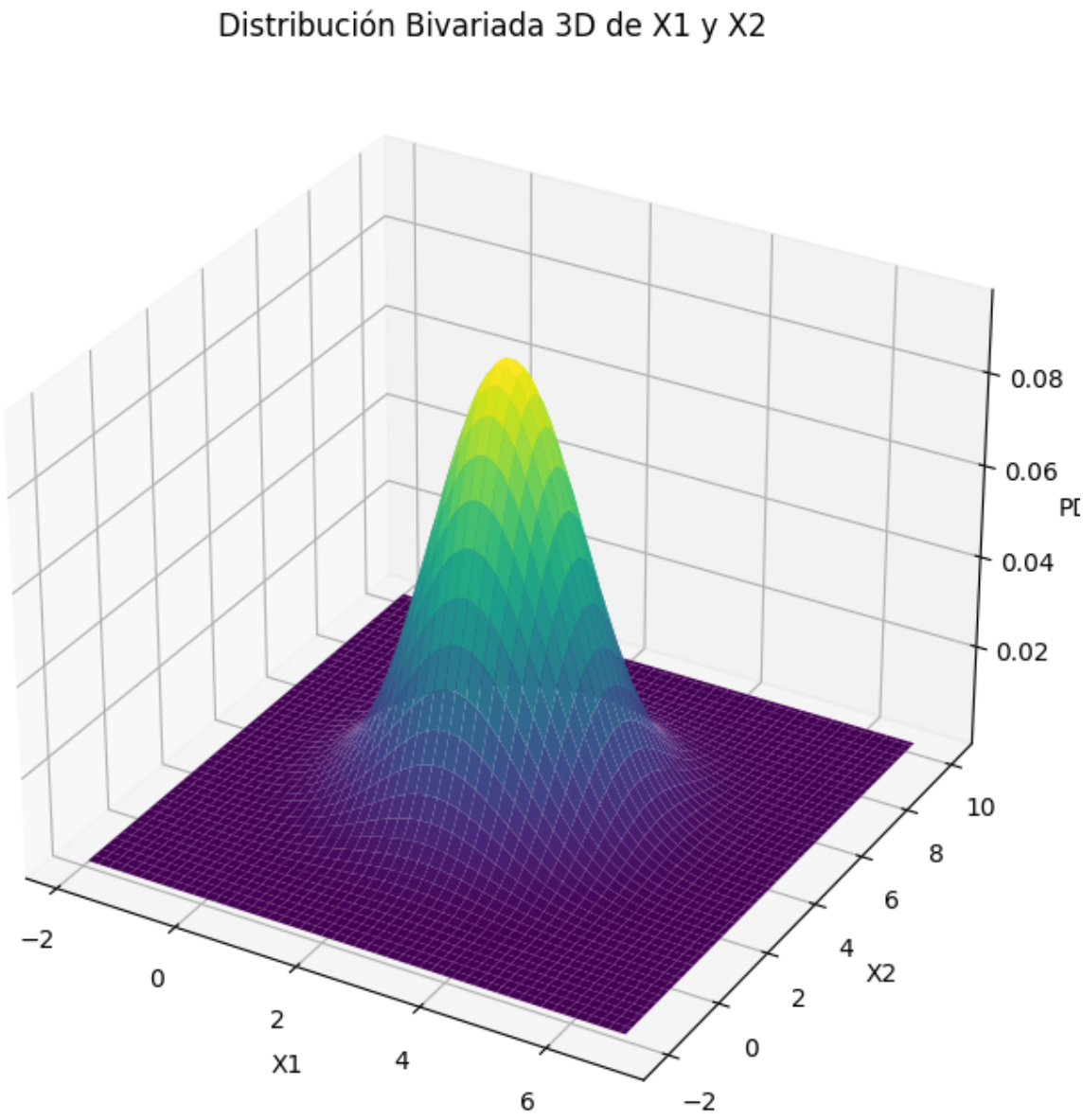
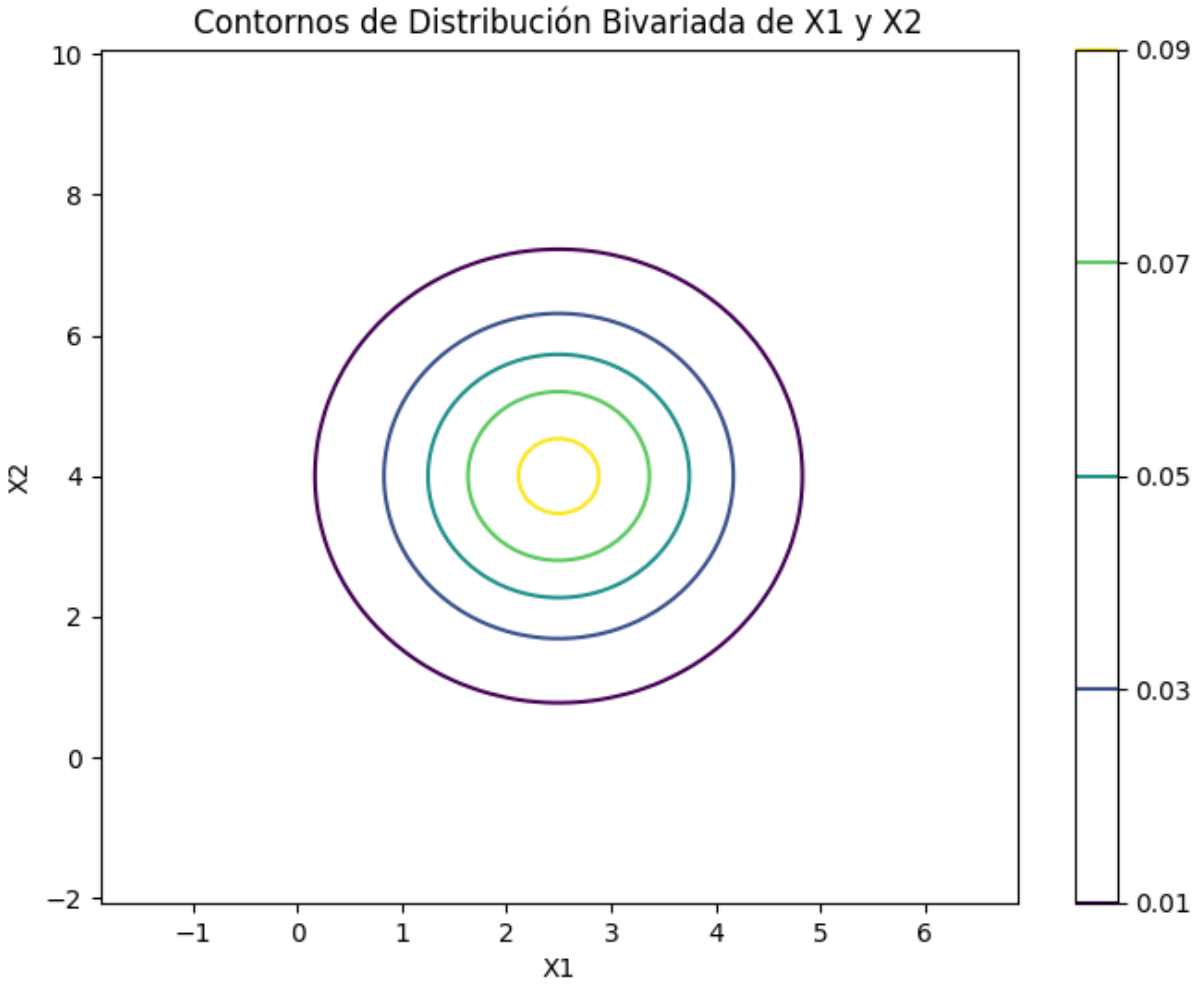
In [ ]:
```
import numpy as np
import matplotlib.pyplot as plt
from mpl_toolkits.mplot3d import Axes3D
from scipy.stats import multivariate_normal
import scipy.stats as stats

mu = [2.5, 4]
covariance_matrix = [[1.2, 0], [0, 2.3]]

x1_lower_bound = -float('inf')
x1_upper_bound = 2
x2_lower_bound = -float('inf')
x2_upper_bound = 3

probability = stats.mvn.mvnun([x1_lower_bound, x2_lower_bound], [x1_upper_bound, x2

print("La probabilidad:", probability)


x1 = np.linspace(mu[0] - 4 * np.sqrt(covariance_matrix[0, 0]), mu[0] + 4 * np.sqrt(
x2 = np.linspace(mu[1] - 4 * np.sqrt(covariance_matrix[1, 1]), mu[1] + 4 * np.sqrt(

X1, X2 = np.meshgrid(x1, x2)
pos = np.dstack((X1, X2))

pdf = multivariate_normal(mu, covariance_matrix).pdf(pos)

fig = plt.figure(figsize=(10, 8))
ax = fig.add_subplot(111, projection='3d')
ax.plot_surface(X1, X2, pdf, cmap='viridis')
ax.set_xlabel('X1')
ax.set_ylabel('X2')
ax.set_zlabel('PDF')
ax.set_title('Distribución Bivariada')
plt.show()

x1 = np.linspace(mu[0] - 4 * np.sqrt(covariance_matrix[0, 0]), mu[0] + 4 * np.sqrt(
x2 = np.linspace(mu[1] - 4 * np.sqrt(covariance_matrix[1, 1]), mu[1] + 4 * np.sqrt(

X1, X2 = np.meshgrid(x1, x2)
pos = np.dstack((X1, X2))

pdf = multivariate_normal(mu, covariance_matrix).pdf(pos)

levels = [0.01, 0.03, 0.05, 0.07, 0.09]

plt.figure(figsize=(8, 6))
contour = plt.contour(X1, X2, pdf, levels, cmap='viridis')
plt.xlabel('X1')
plt.ylabel('X2')
plt.title('Contornos')
plt.colorbar(contour)
plt.show()
```

```
<ipython-input-1-ef9aca61e8b9>:18: DeprecationWarning: Please use `mvnun` from the `scipy.stats` namespace, the `scipy.stats.mvn` namespace is deprecated.
  probability = stats.mvn.mvnun([x1_lower_bound, x2_lower_bound], [x1_upper_bound, x2_upper_bound], mu, covariance_matrix)
La probabilidad P(X1 <= 2, X2 <= 3) es: (0.08257333341548989, 0)
```




Contornos de Distribución Bivariada de X1 y X2
X1
X2
10
8
6
4
2
0
−2
−1
0
1
2
3
4
5
6
0.09
0.07
0.05
0.03
0.01