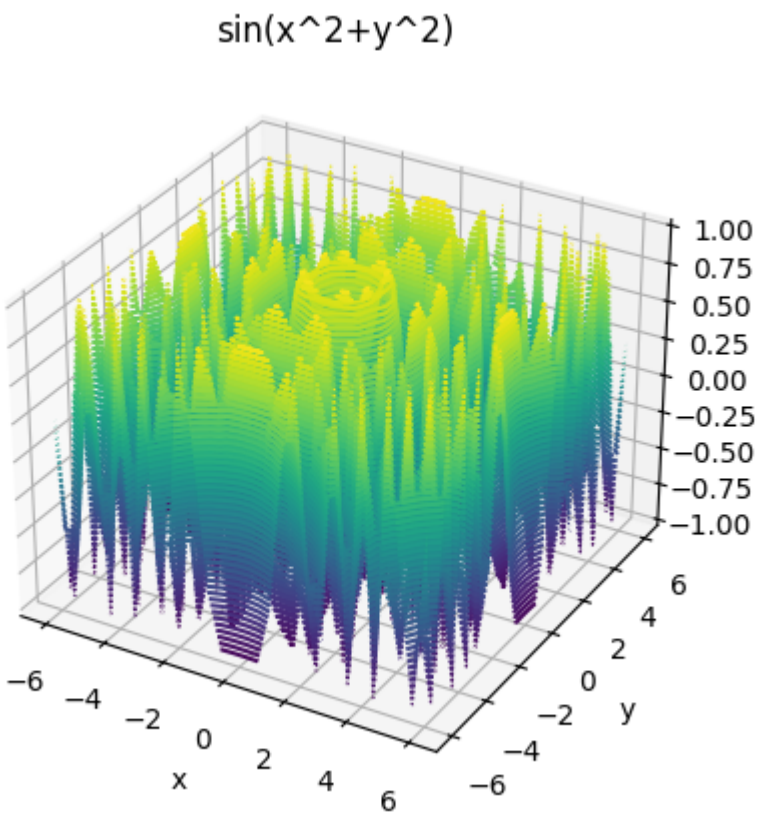
Name - Tej Santosh Sutar Roll No. 176 std -SY Bsc(CS) Batch - H Date 04/01/2025 Practical no 2 - 3D Graph Plotting Q.1)Using python, generate 3D surface Plot for the functioni) a) f(x) = sin(x2 + y2) in the interval [-6,6]. b) f(x) = sin(x2 + y2) in the interval [0,10]. a) f(x) = sin(x2 + y2) in the interval [-6,6].

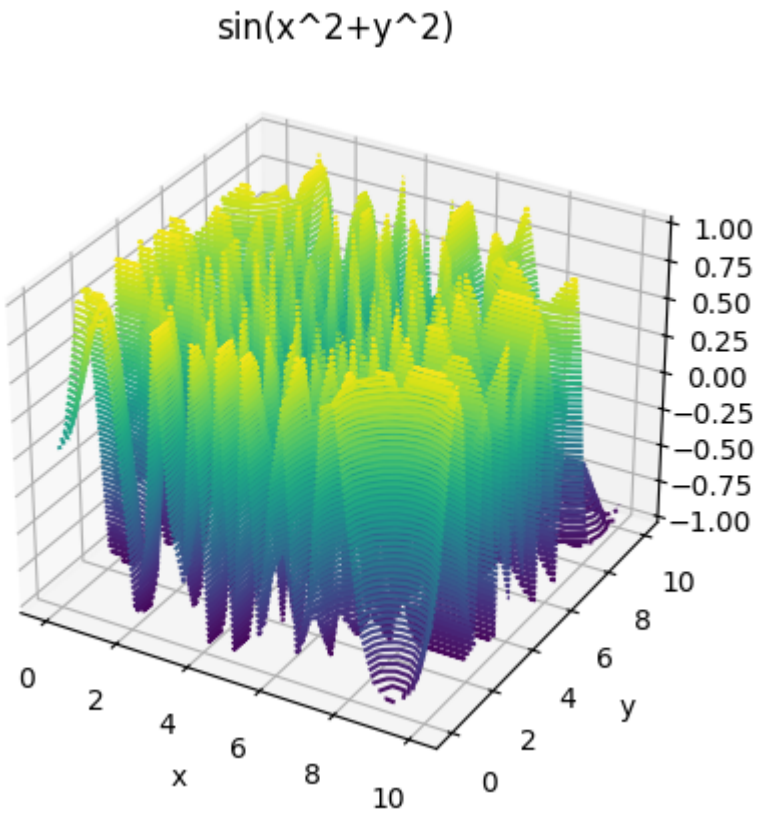
In [15]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.sin(x**2+y**2)
x=np.linspace(-6,6,30)
y=np.linspace(-6,6,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('sin(x^2+y^2)')
show()
```



b) f(x) = sin(x2 + y2) in the interval [0,10].

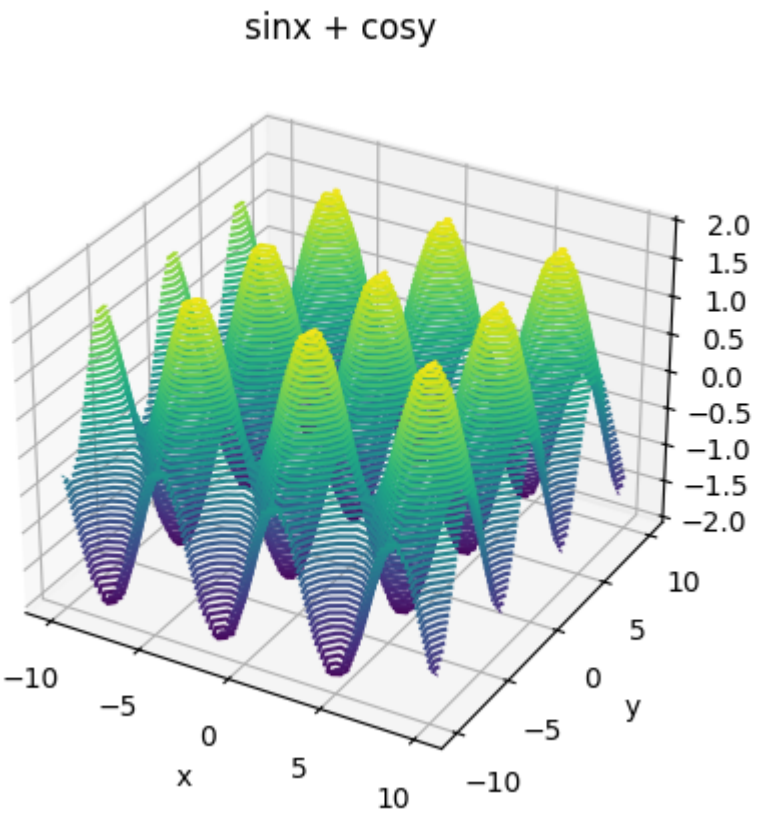
In [13]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.sin(x**2+y**2)
x=np.linspace(0,10,30)
y=np.linspace(0,10,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
```

```
title('sin(x^2+y^2)')
show()
```



ii) z = sinx + cosy in −10 < x, y < 10

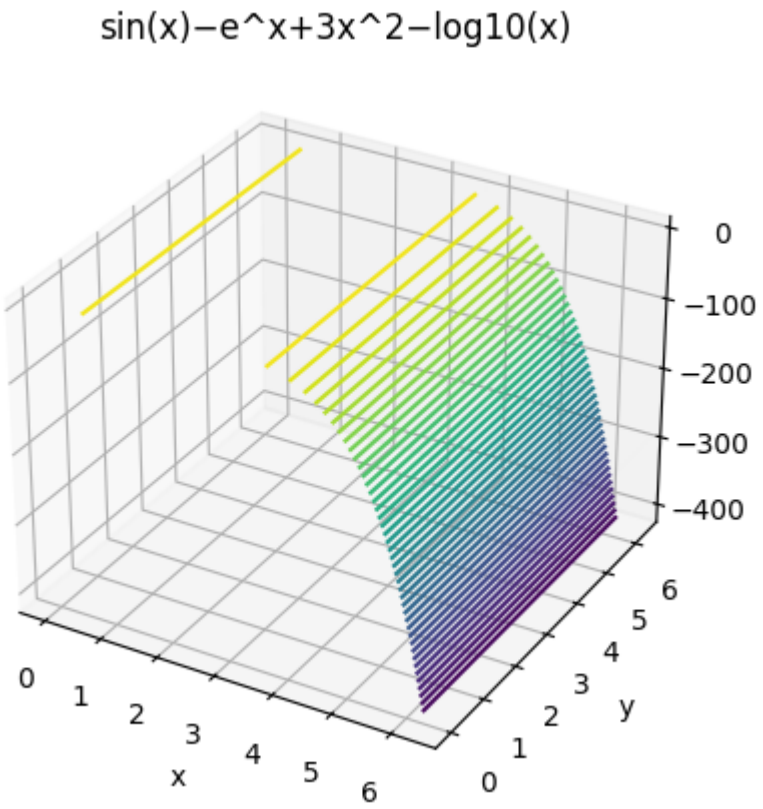
In [11]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.sin(x) + np.cos(y)
x=np.linspace(-10,10,30)
y=np.linspace(-10,10,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('sinx + cosy')
show()
```



iii) f(x) = sin(x)−e^x+3x^2−log10(x) on the Interval [0,2π].

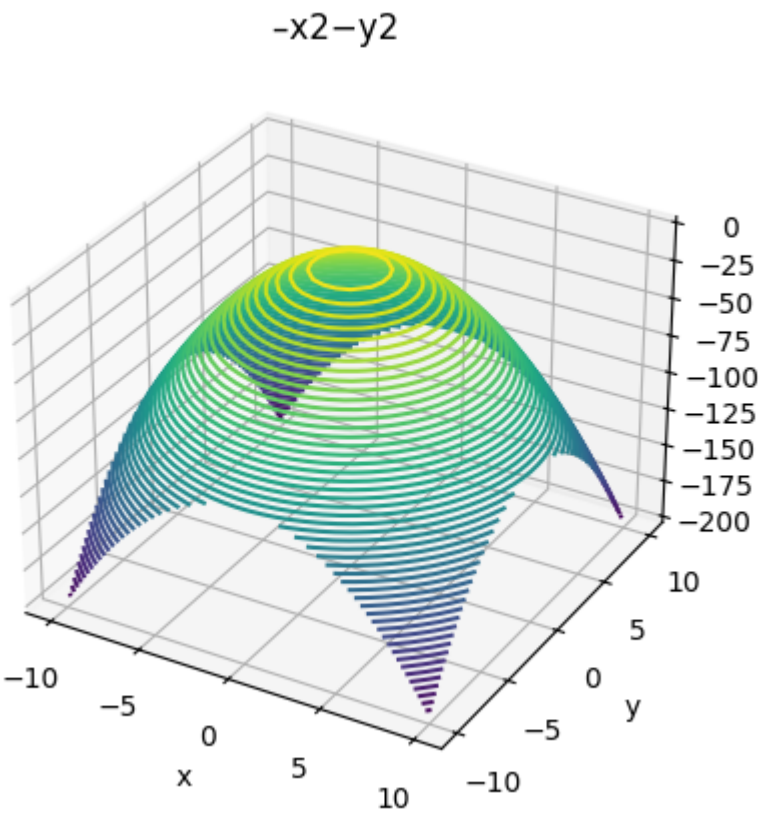
In [17]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.sin(x)-e**x+3*x**2-log10(x)
x=np.linspace(0,2*pi,30)
y=np.linspace(0,2*pi,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('sin(x)-e^x+3x^2-log10(x)')
show()
```

```
C:\Users\Student\AppData\Local\Temp\ipykernel_9852\4294359593.py:5: RuntimeWarnin
g: divide by zero encountered in log10
  return np.sin(x)-e**x+3*x**2-log10(x)
```



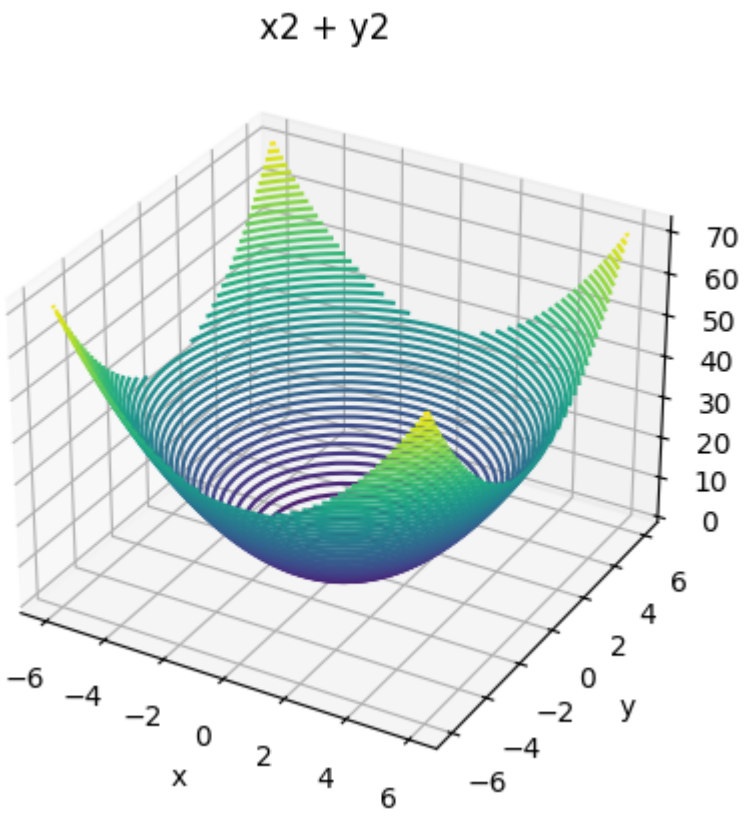
iv) f(x,y) = –x2 −y2 when −10 ≤ x, y ≤ 10.

In [19]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return -x**2-y**2
x=np.linspace(-10,10,30)
y=np.linspace(-10,10,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('-x2-y2 ')
show()
```



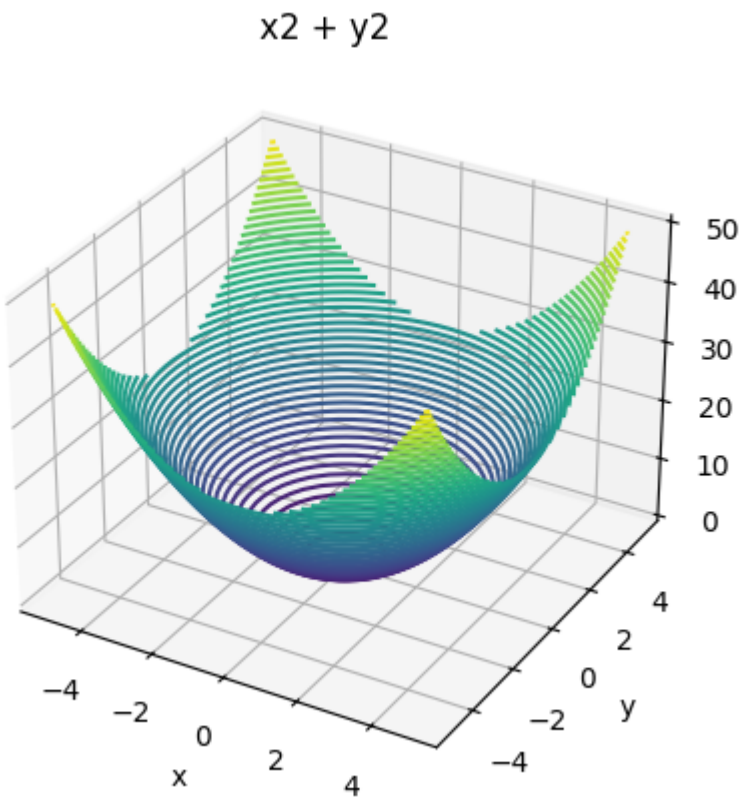
v) z = x2 + y2 in −6 < x, y < 6 using surface plot.

In [21]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return x**2+y**2
x=np.linspace(-6,6,30)
y=np.linspace(-6,6,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('x2 + y2  ')
show()
```



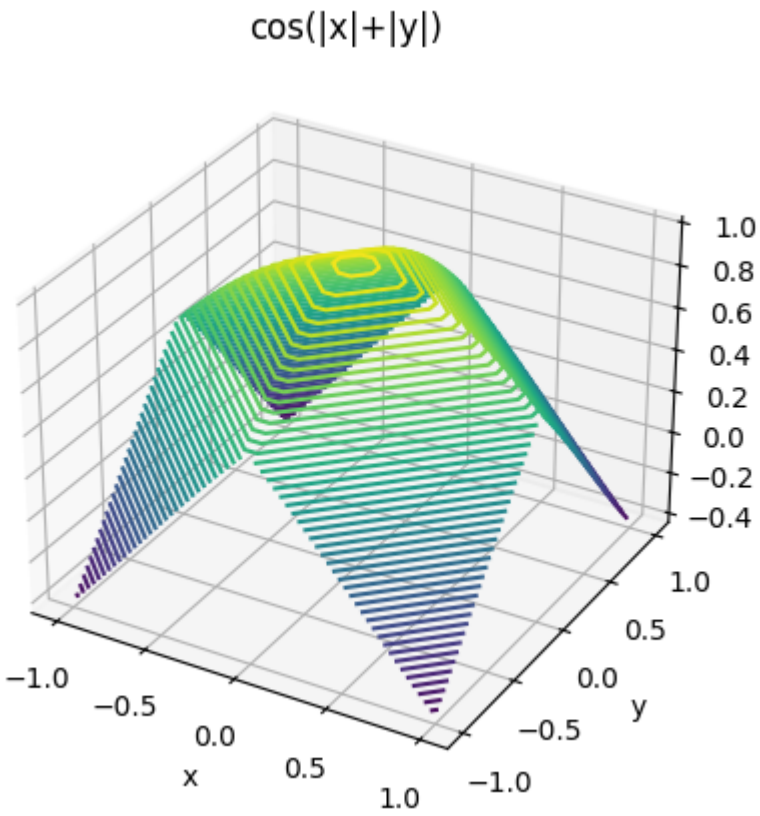
vi) z = x2 + y2 in −5 < x, y < 5.

In [23]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return x**2+y**2
x=np.linspace(-5,5,30)
y=np.linspace(-5,5,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('x2 + y2  ')
show()
```



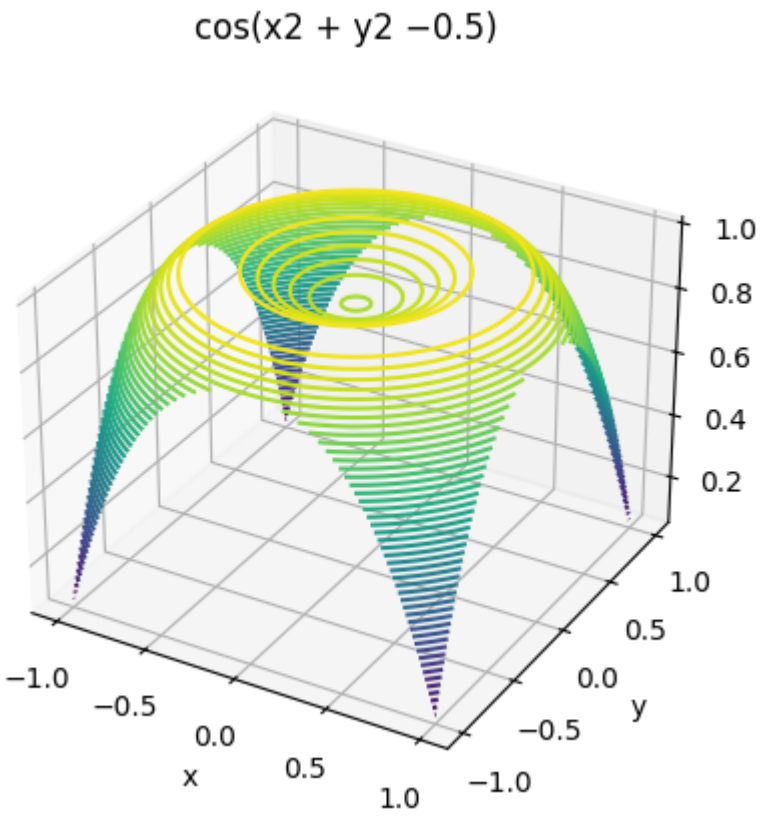
vii) z = cos(|x|+|y|) in −1 < x,y < 1.

In [27]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.cos(abs(x)+abs(y))
x=np.linspace(-1,1,30)
y=np.linspace(-1,1,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('cos(|x|+|y|)')
show()
```



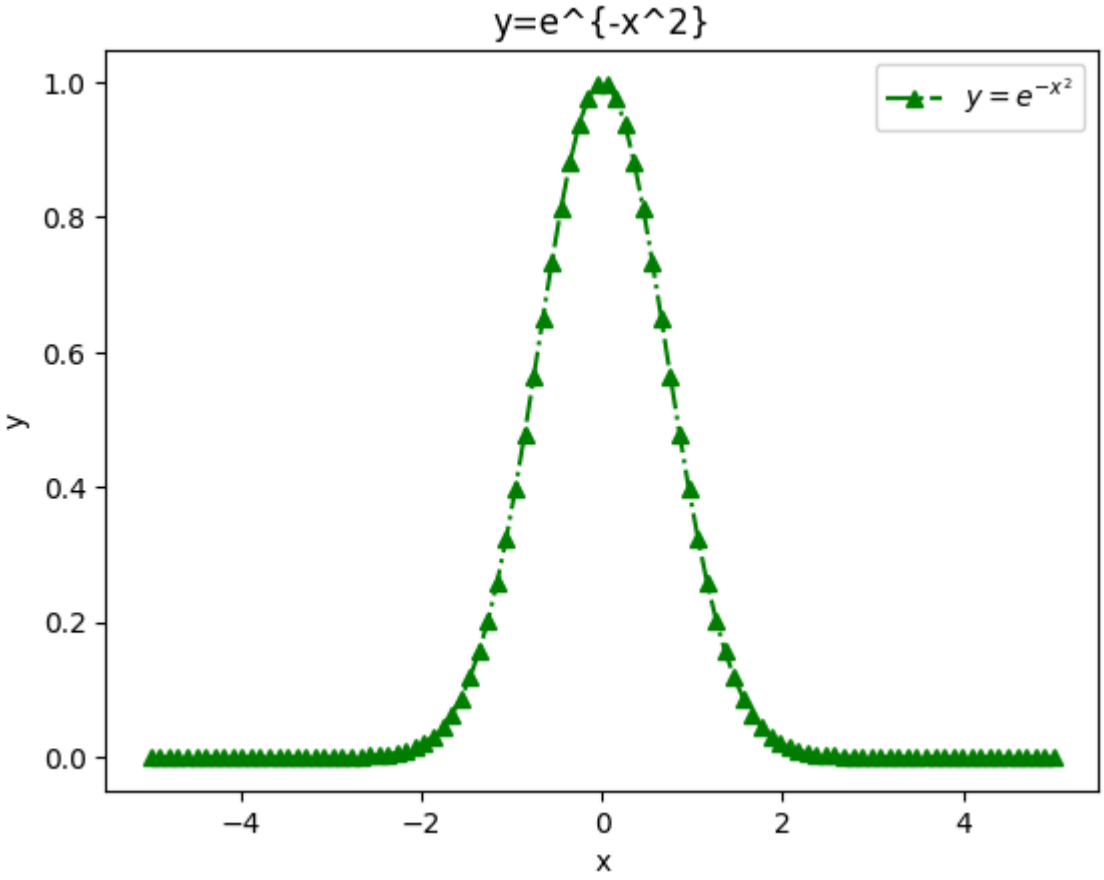
viii) z = cos(x2 + y2 −0.5) in the interval from −1 < x , y < 1.

In [35]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.cos(x**2+y**2-0.5)
x=np.linspace(-1,1,1000)
y=np.linspace(-1,1,1000)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.contour3D(X,Y,Z,50)
xlabel('x')
ylabel('y')
title('cos(x2 + y2 -0.5)')
show()
```



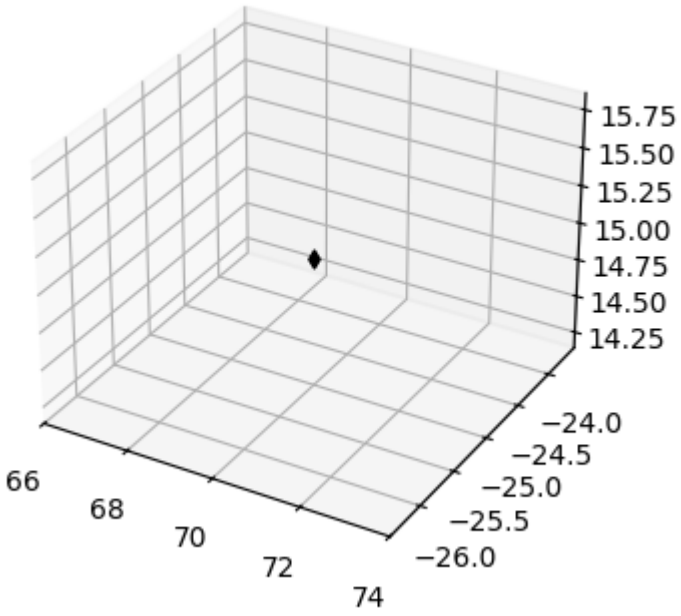
Q.2) Write a Python program to plot 2D graph of the function f(x) = e-x2 in [−5,5] with green dashed points line with upward pointing triangle.

In [49]:
```
from pylab import*
import numpy as np
x=np.linspace(-5,5,100)
y=np.exp(-x**2)
plot(x,y,"-.^g",label="$y=e^{-x^2}$")
xlabel('x')
ylabel('y')
title('y=e^{-x^2}')
legend()
show()
```



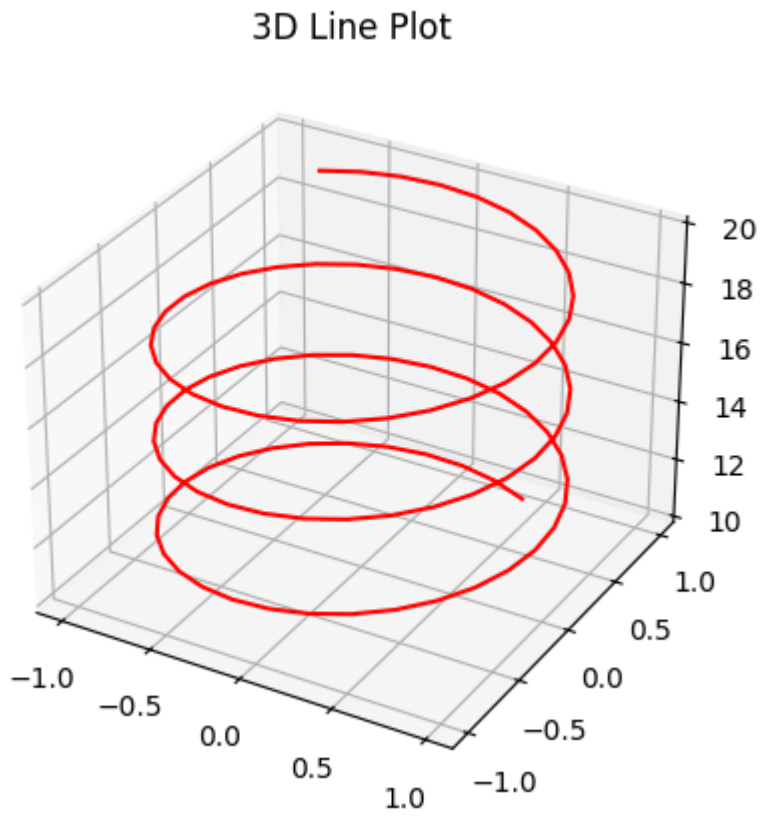
Q.3) Write a python program to plot 3D axes with labels as X−axis, Y−axis and Z−axis and also plot following point with given coordinates in the same graph: (70,−25,15) as a diamond in black color.

In [53]:
```
from mpl_toolkits import mplot3d
import matplotlib.pyplot as plt
import numpy as np
fig=plt.figure(figsize=(4,4))
ax=fig.add_subplot(111,projection='3d')
ax.scatter(70,-25,15,c='k',marker='d')
plt.show()
```



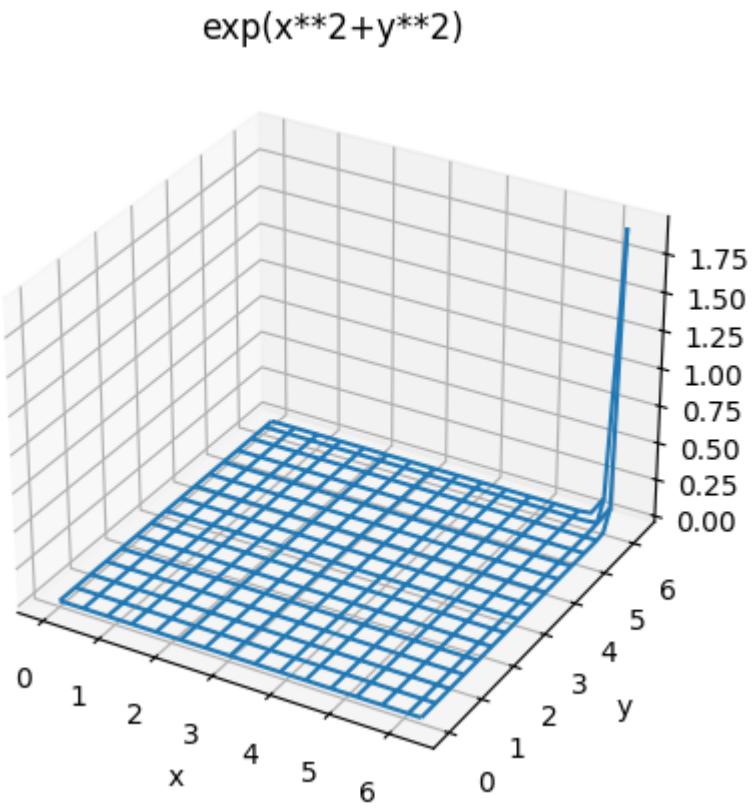
Q.4) Write a python program to plot the 3D line graph whose parametric equation is (cos(2x),sin(2x),x) for $10 \leq x \leq 20$ (in red color), with title to the graph.

In [57]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
fig=plt.figure()
ax=plt.axes(projection='3d')
z=np.linspace(10,20,100)
x=np.cos(2*z)
y=np.sin(2*z)
ax.plot3D(x,y,z,'red')
ax.set_title('3D Line Plot')
show()
```



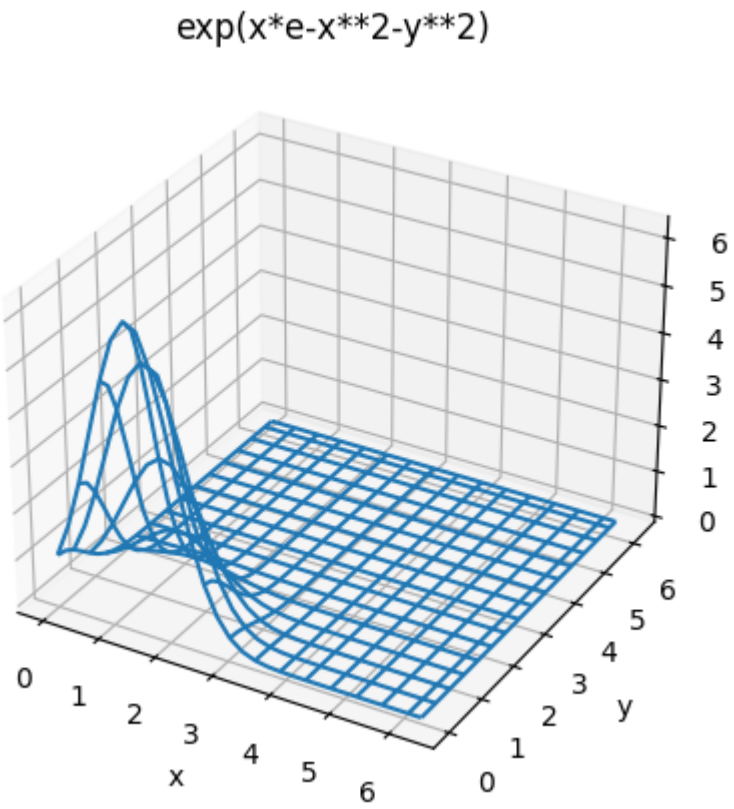
Q.5)Write a Python program to plot the 3D graph of the function f(x) = ex^2+y^2 for x,y ∈ [0,2π] using wireframe.

In [61]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.exp(x**2+y**2)
x=np.linspace(0,2*pi,30)
y=np.linspace(0,2*pi,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.plot_wireframe(X,Y,Z,rstride=2,cstride=2)
xlabel('x')
ylabel('y')
title('exp(x**2+y**2)')
show()
```



Q.6)Write a Python program to plot the 3D graph of the function f(x) = xe-x^2-y^2for x,y ∈ [0,2π] using

In [69]:
```
from mpl_toolkits import mplot3d
import numpy as np
from pylab import*
def f(x,y):
    return np.exp(x*e-x**2-y**2)
x=np.linspace(0,2*pi,30)
y=np.linspace(0,2*pi,30)
X,Y=np.meshgrid(x,y)
Z=f(X,Y)
ax=axes(projection='3d')
ax.plot_wireframe(X,Y,Z,rstride=2,cstride=2)
xlabel('x')
ylabel('y')
title('exp(x*e-x**2-y**2)')
show()
```



In [ ]: