H2_graphics

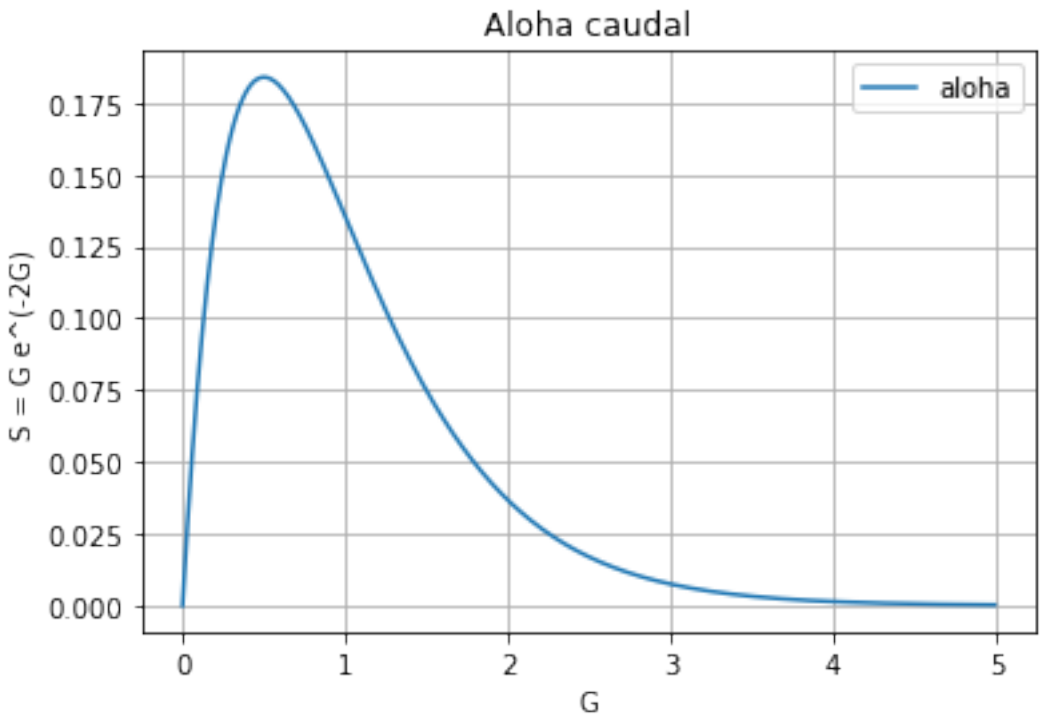
March 1, 2022

[209]:
```
from mpl_toolkits import mplot3d
import matplotlib.pyplot as plt
import matplotlib
import numpy as np
```

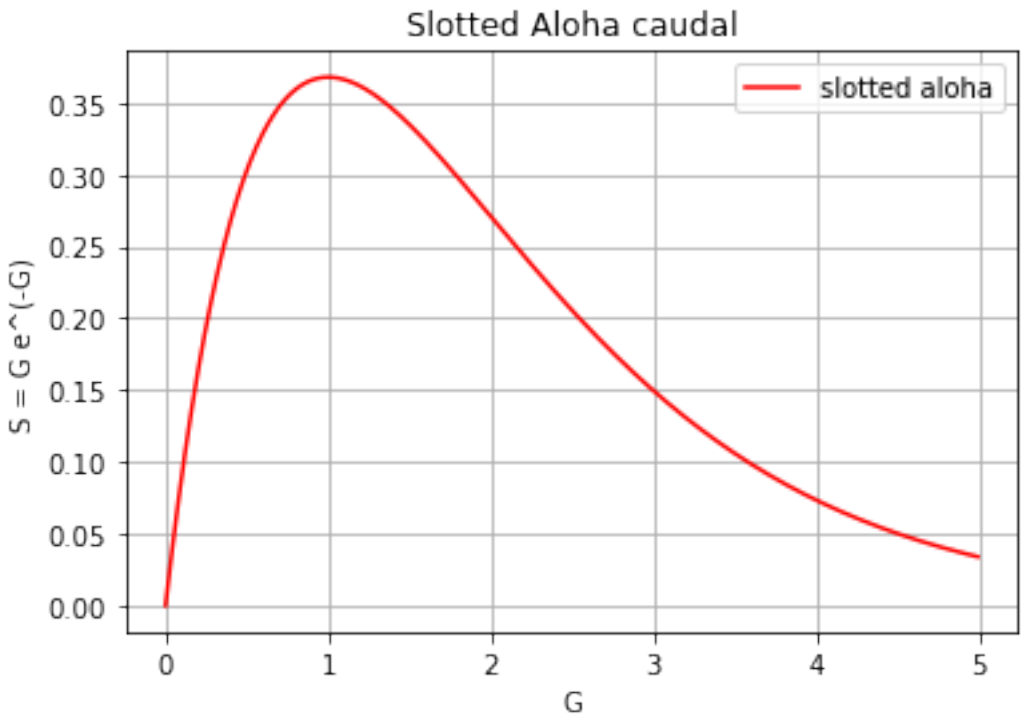
[210]:
```
%matplotlib inline
```

[211]:
```
# Time data
t = np.arange(0, 5.0, 0.01)
```

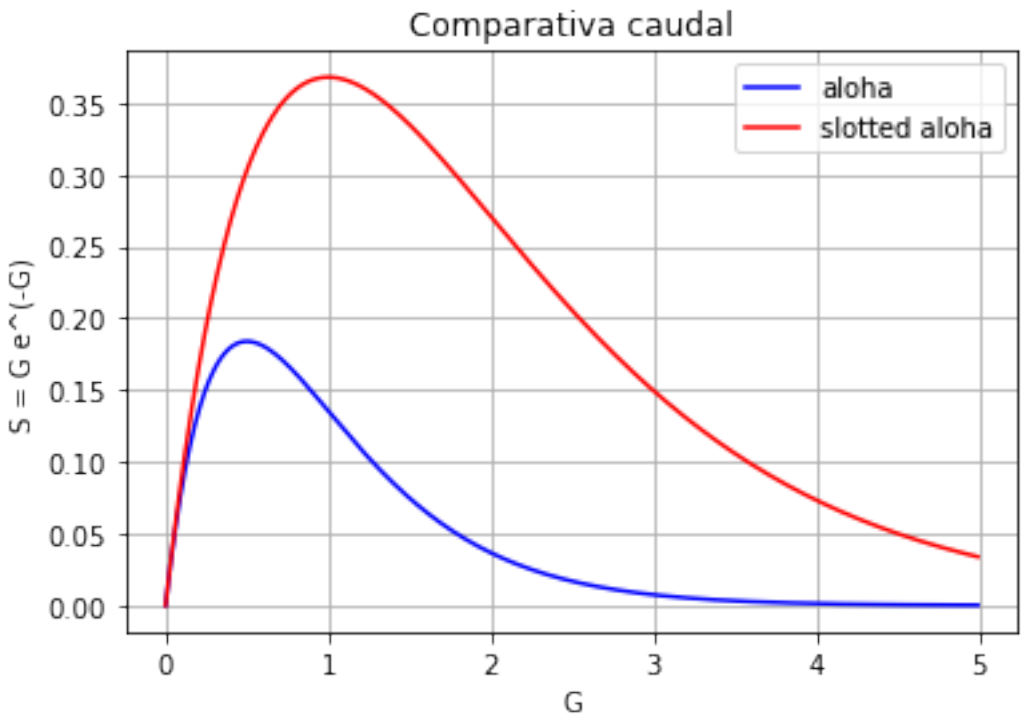
[212]:
```
# Data for plotting Aloha protocol
aloha = t * np.exp(-2*t)

fig, ax = plt.subplots()
ax.plot(t, aloha, label="aloha")

ax.set(xlabel='G', ylabel='S = G e^(-2G)',
       title='Aloha caudal')

ax.grid()

plt.legend()
plt.show()
fig.savefig("Aloha_throughput.png")
```



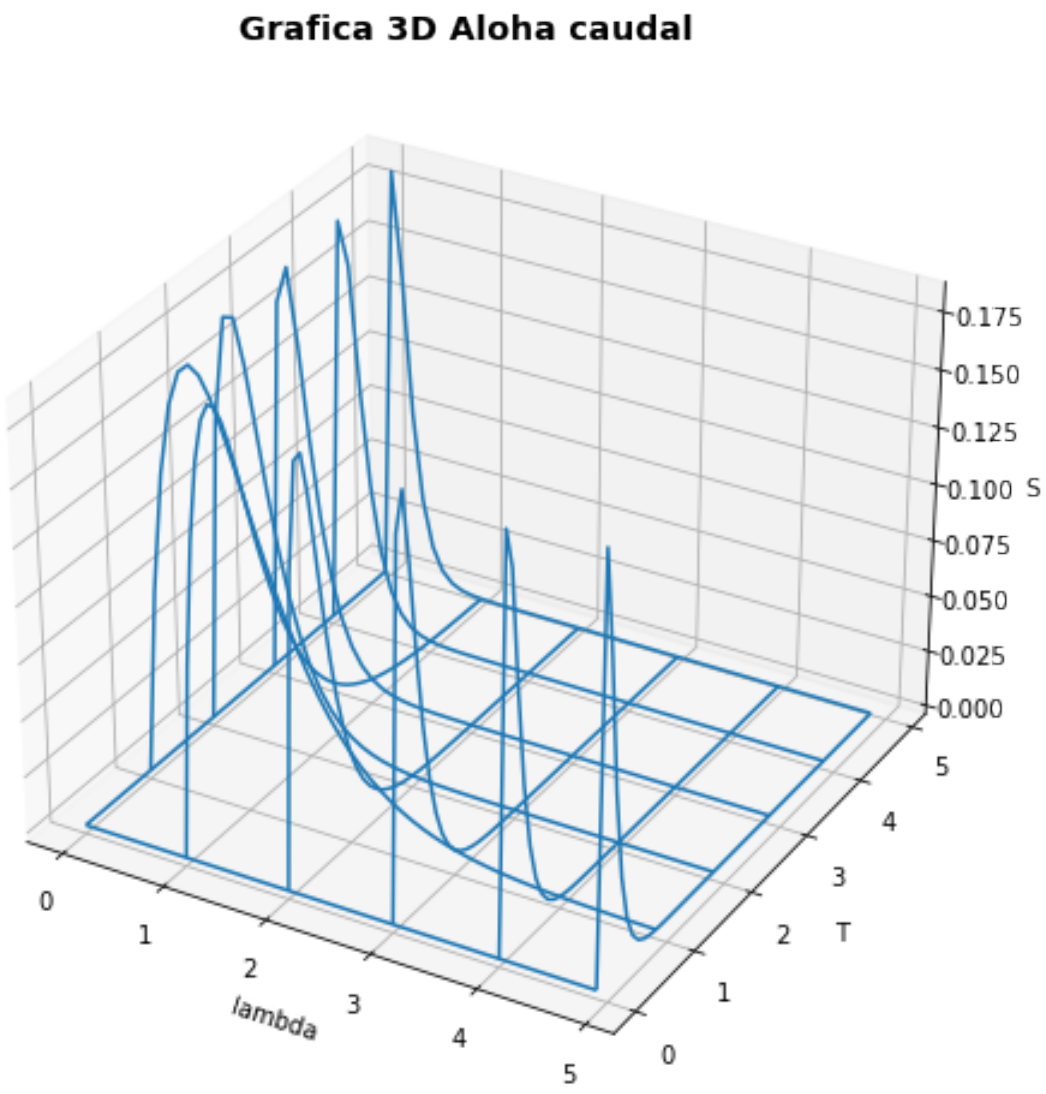
[213]:
```
# Data for plotting Slotted Aloha protocol
slotted_aloha = t * np.exp(-t)

fig, ax = plt.subplots()
ax.plot(t, slotted_aloha, color='r',label="slotted aloha")
ax.set(xlabel='G', ylabel='S = G e^(-G)',
       title='Slotted Aloha caudal')
ax.grid()
plt.legend()
plt.show()
fig.savefig("Slotted_Aloha_throughput.png")
```



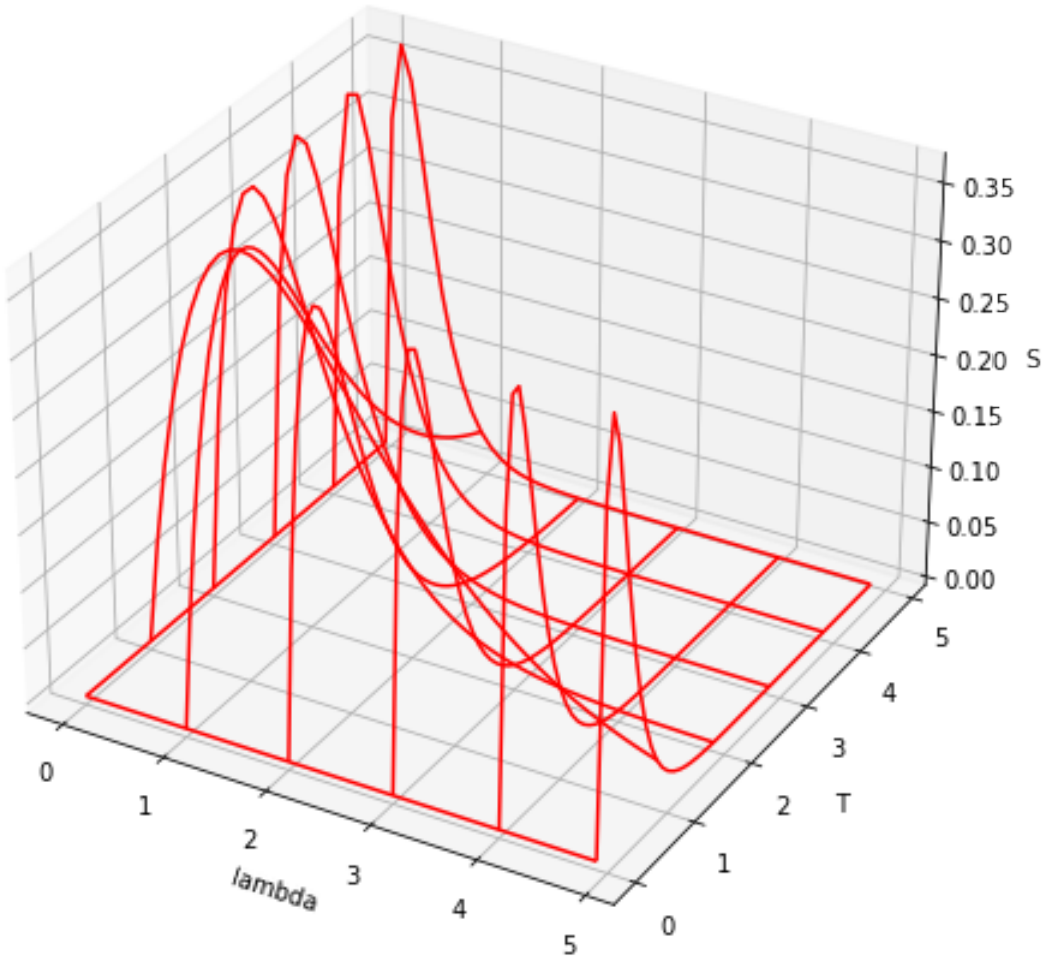
[214]:
```
fig, ax = plt.subplots()
ax.plot(t, aloha, color='b', label="aloha")
ax.plot(t, slotted_aloha, color='r', label="slotted aloha")
ax.set(xlabel='G', ylabel='S = G e^(-G)',
       title='Comparativa caudal')
ax.grid()
plt.legend()
plt.show()
fig.savefig("throughput_comparison.png")
```



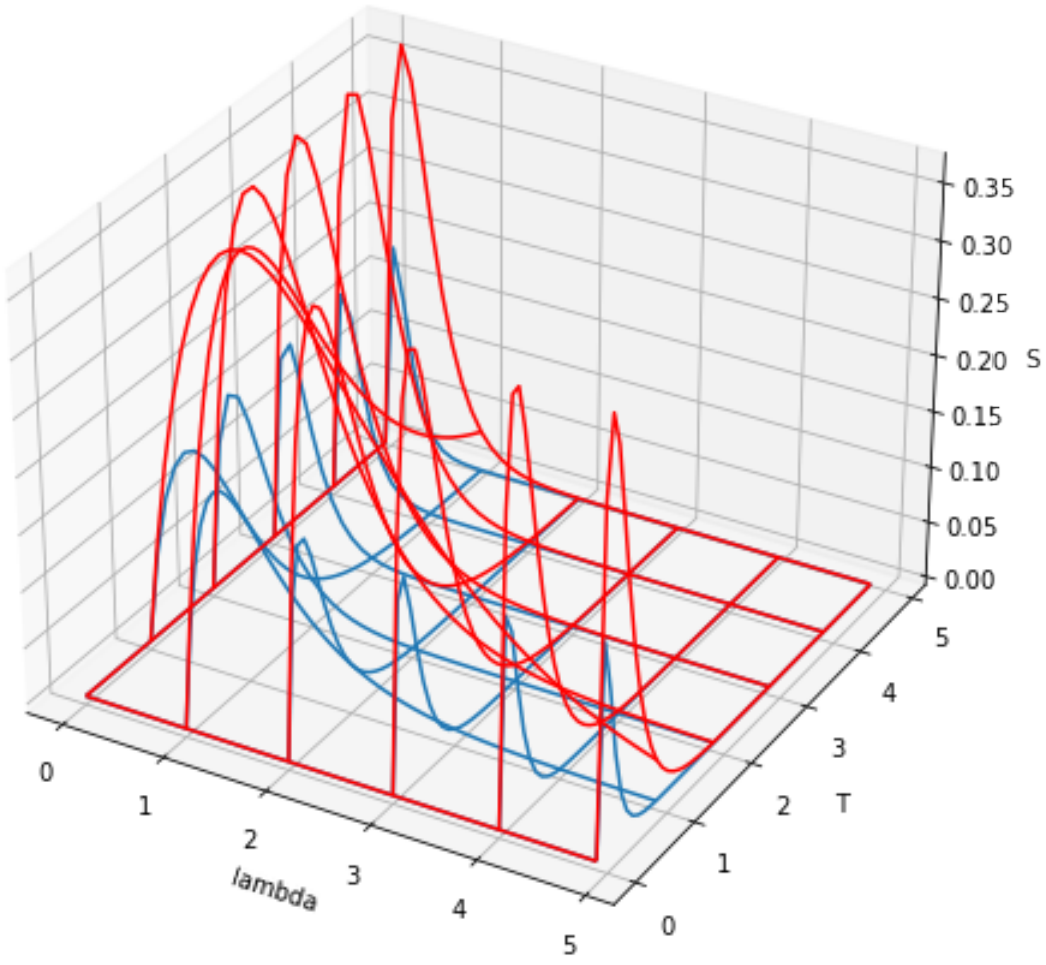
[215]:
```
#3D wireframe for aloha
x = np.arange(0, 5.0, 0.1)
y = np.arange(0, 5.0, 0.1)
x2, y2 = np.meshgrid(x, y)

# Compute z to make aloha surface.
z_aloha = x2 * y2 * np.exp((-2) * x2 * y2)

fig = plt.figure(figsize=(8, 8))
ax = fig.add_subplot(projection='3d')
ax.plot_wireframe(x2, y2, z_aloha, rstride=10, cstride=10)
ax.set_title("Grafica 3D Aloha caudal ",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")

plt.show()
fig.savefig("Aloha_3D_throughput.png")
```



[216]:
```
# Compute z to make slotted aloha surface.
z_slotted_aloha = x2 * y2 * np.exp((-1) * x2 * y2)

fig = plt.figure(figsize=(8, 8))
ax = fig.add_subplot(projection='3d')
ax.plot_wireframe(x2, y2, z_slotted_aloha, rstride=10, cstride=10, color='r')
ax.set_title("Grafica 3D Slotted Aloha caudal ",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")
plt.show()
fig.savefig("Slotted_Aloha_3D_throughput.png")
```

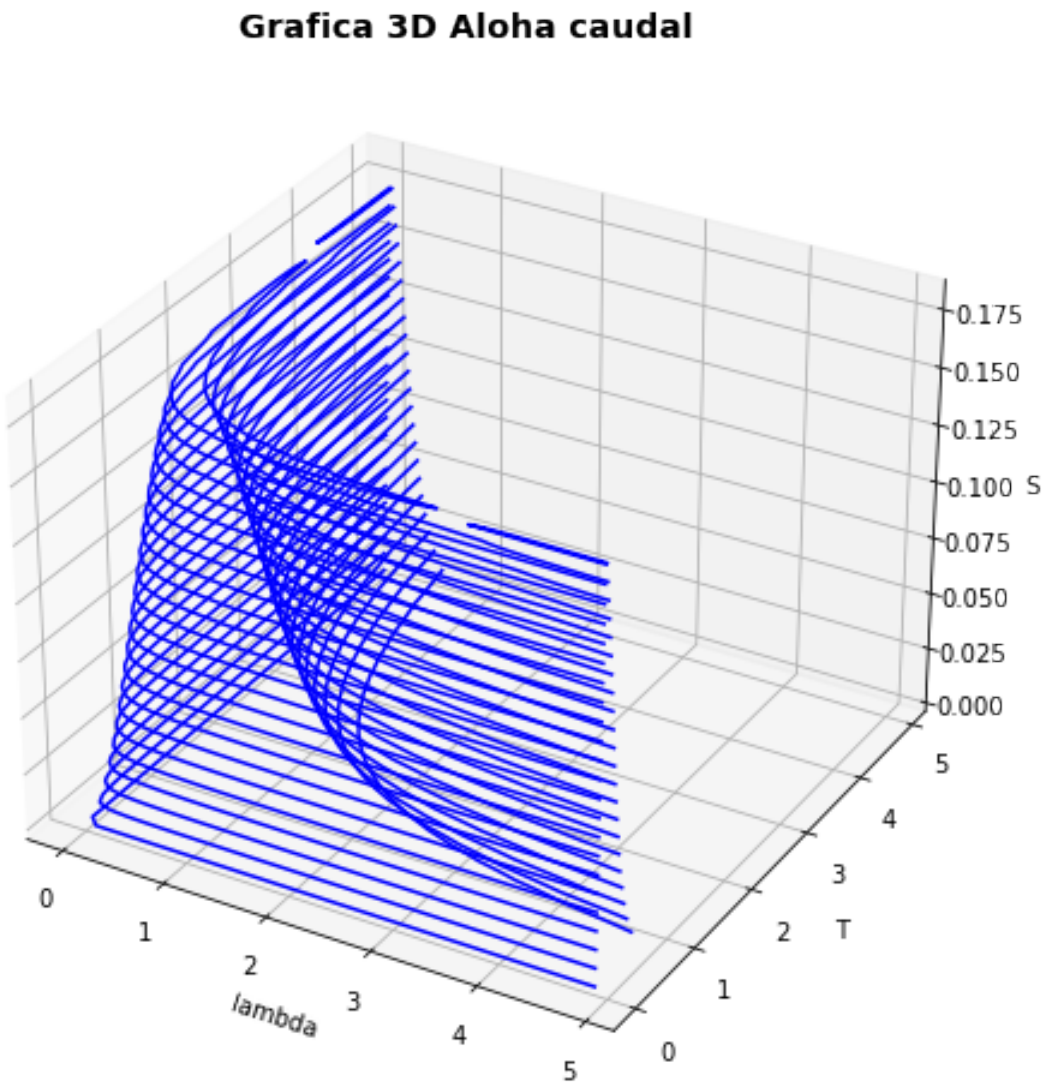


[217]:
```
fig = plt.figure(figsize=(8, 8))
ax = fig.add_subplot(projection='3d')
ax.plot_wireframe(x2, y2, z_aloha, rstride=10, cstride=10)
ax.plot_wireframe(x2, y2, z_slotted_aloha, rstride=10, cstride=10, color='r')
ax.set_title("Comparativa 3D ",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")
plt.show()
fig.savefig("Comparativa_3D_throughput.png")
```



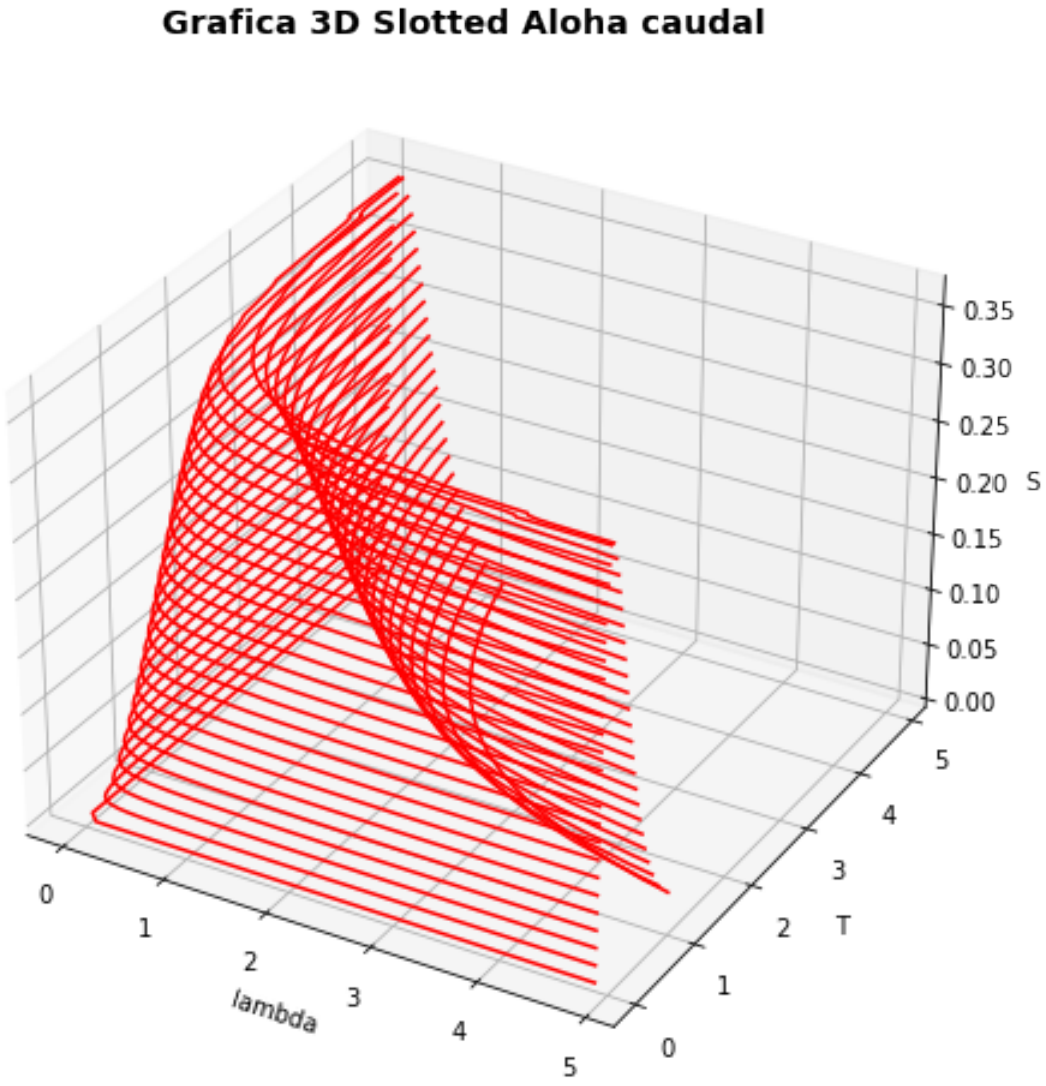
[218]:
```
# Creating figure
fig = plt.figure(figsize=(8, 8))
ax = plt.axes(projection ='3d')
ax.set_title("Grafica 3D Aloha caudal ",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")

# Creating plot
ax.contour3D(x2, y2, z_aloha, 25, colors='blue')

# show plot
plt.show()
```

```
fig.savefig("Aloha_3D_throughput_v2.png")
```



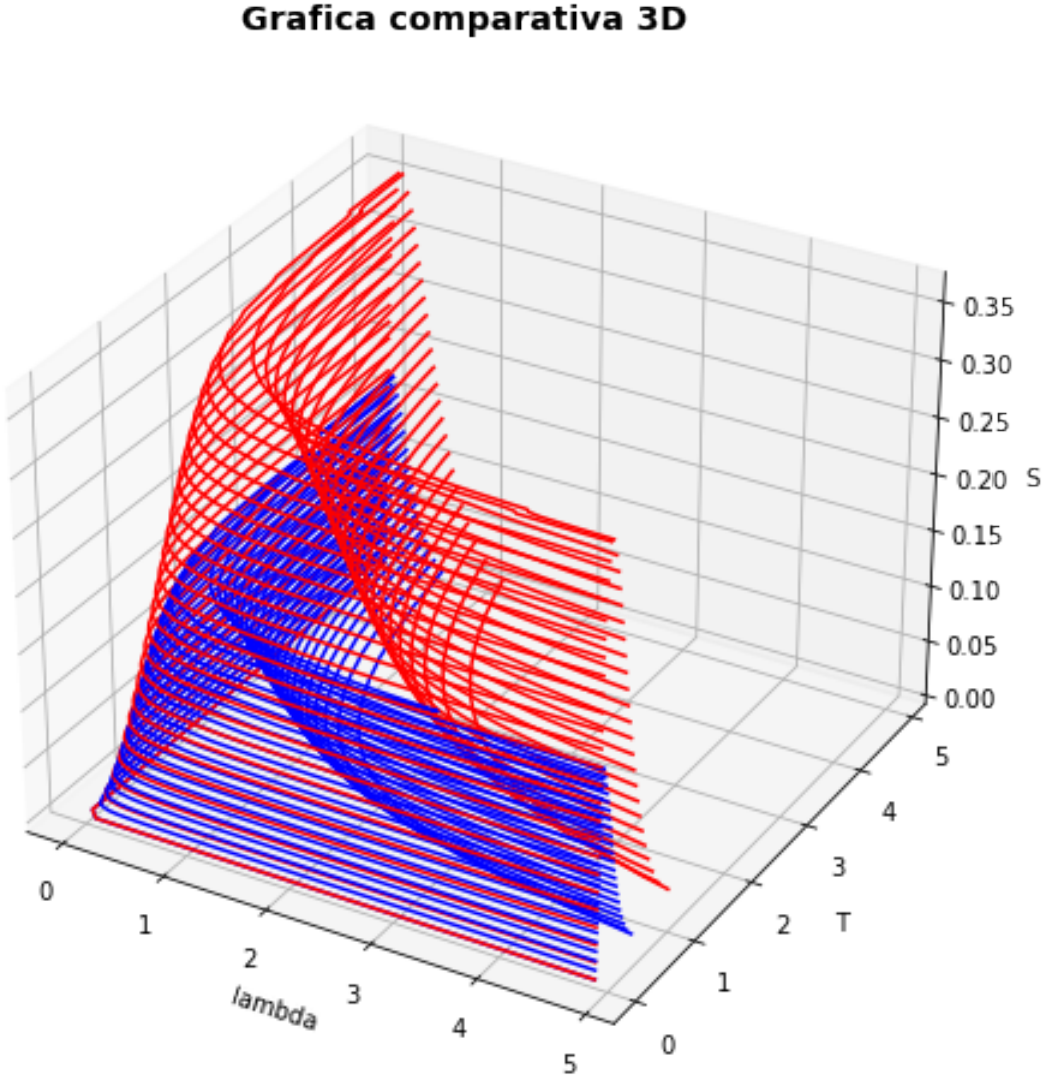
[219]:
```
# Creating figure
fig = plt.figure(figsize=(8, 8))
ax = plt.axes(projection ='3d')
ax.set_title("Grafica 3D Slotted Aloha caudal ",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")

# Creating plot
ax.contour3D(x2, y2, z_slotted_aloha, 25, colors='red')
```

```
# show plot
plt.show()
fig.savefig("Slotted_Aloha_3D_throughput_v2.png")
```



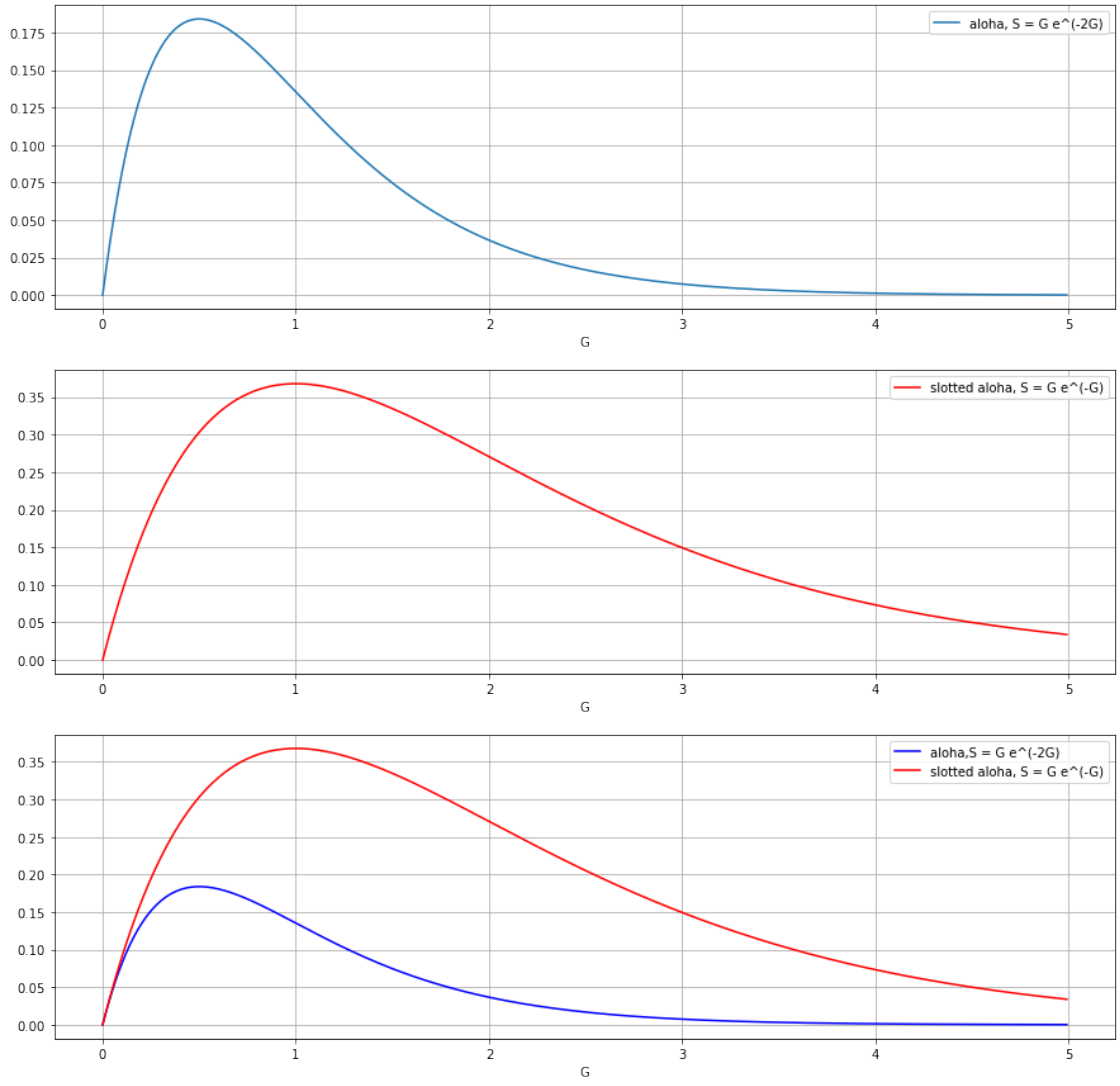
[220]:
```
# Creating figure
fig = plt.figure(figsize=(8, 8))
ax = plt.axes(projection ='3d')
ax.set_title("Grafica comparativa 3D ",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")

# Creating plot
```

```
ax.contour3D(x2, y2, z_aloha, 25, colors='blue')
ax.contour3D(x2, y2, z_slotted_aloha, 25, colors='red')

# show plot
plt.show()
fig.savefig("Comparativa_3D_throughput_v2.png")
```

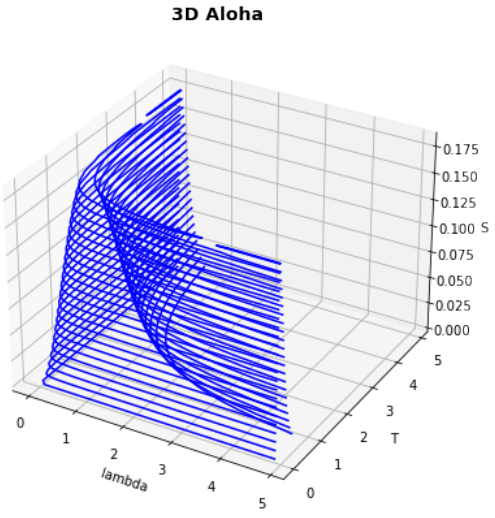


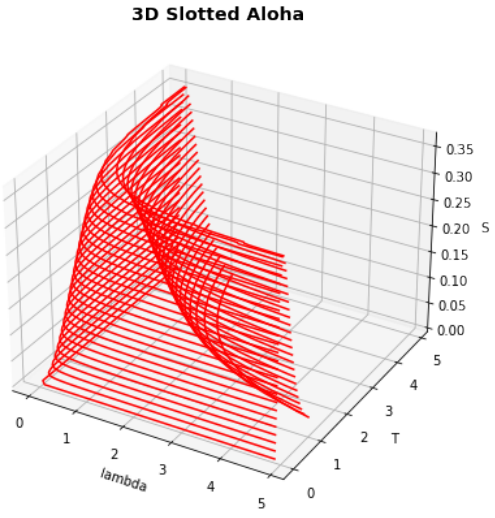
[229]:
```
fig, ax = plt.subplots(3,figsize=(15,15))
ax[0].plot(t, aloha, label="aloha, S = G e^(-2G)")
ax[0].set(xlabel='G')
ax[0].grid()
ax[0].legend()
```

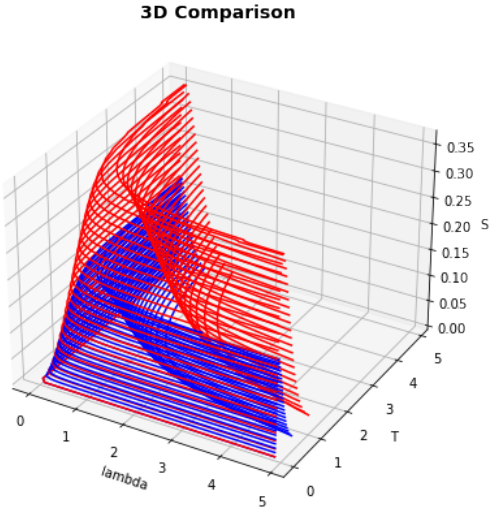
```
ax[1].plot(t, slotted_aloha, color='r',label="slotted aloha, S = G e^(-G)")
ax[1].set(xlabel='G')
ax[1].grid()
ax[1].legend()

ax[2].plot(t, aloha, color='b', label="aloha,S = G e^(-2G)")
ax[2].plot(t, slotted_aloha, color='r', label="slotted aloha, S = G e^(-G)")
ax[2].set(xlabel='G')
ax[2].grid()
ax[2].legend()

plt.show()
fig.savefig("2D_merged.png")
```



[235]:
```
# Creating figure
fig = plt.figure(figsize=(15, 15))

ax = fig.add_subplot(2, 2, 1, projection='3d')
ax.set_title("3D Aloha",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")
# Creating plot
ax.contour3D(x2, y2, z_aloha, 25, colors='blue')

ax = fig.add_subplot(2, 2, 2, projection='3d')
ax.set_title("3D Slotted Aloha",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")
# Creating plot
ax.contour3D(x2, y2, z_slotted_aloha, 25, colors='red')

ax = fig.add_subplot(2, 2, 3, projection='3d')
ax.set_title("3D Comparison",fontsize=14,fontweight="bold")
ax.set_xlabel("lambda")
ax.set_ylabel("T")
ax.set_zlabel("S")
# Creating plot
ax.contour3D(x2, y2, z_aloha, 25, colors='blue')
ax.contour3D(x2, y2, z_slotted_aloha, 25, colors='red')

# show plot
plt.show()
fig.savefig("3D_merged_v2.png")
```


3D Aloha
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
S
lambda
T


3D Slotted Aloha
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
S
lambda
T


3D Comparison
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
S
lambda
T

[ ]: