Q_1_b_Post_Processing

February 27, 2023

1 Import the necessary libraries

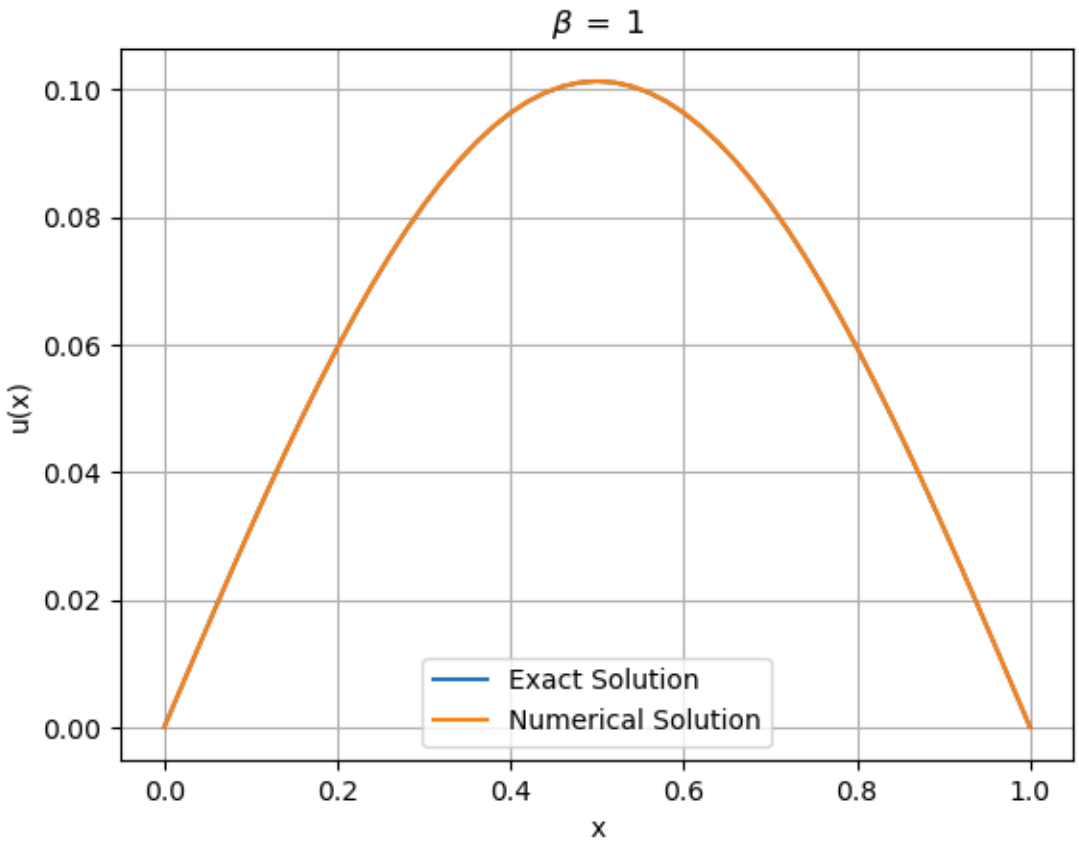
[1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

2 Reading the file for different values of β

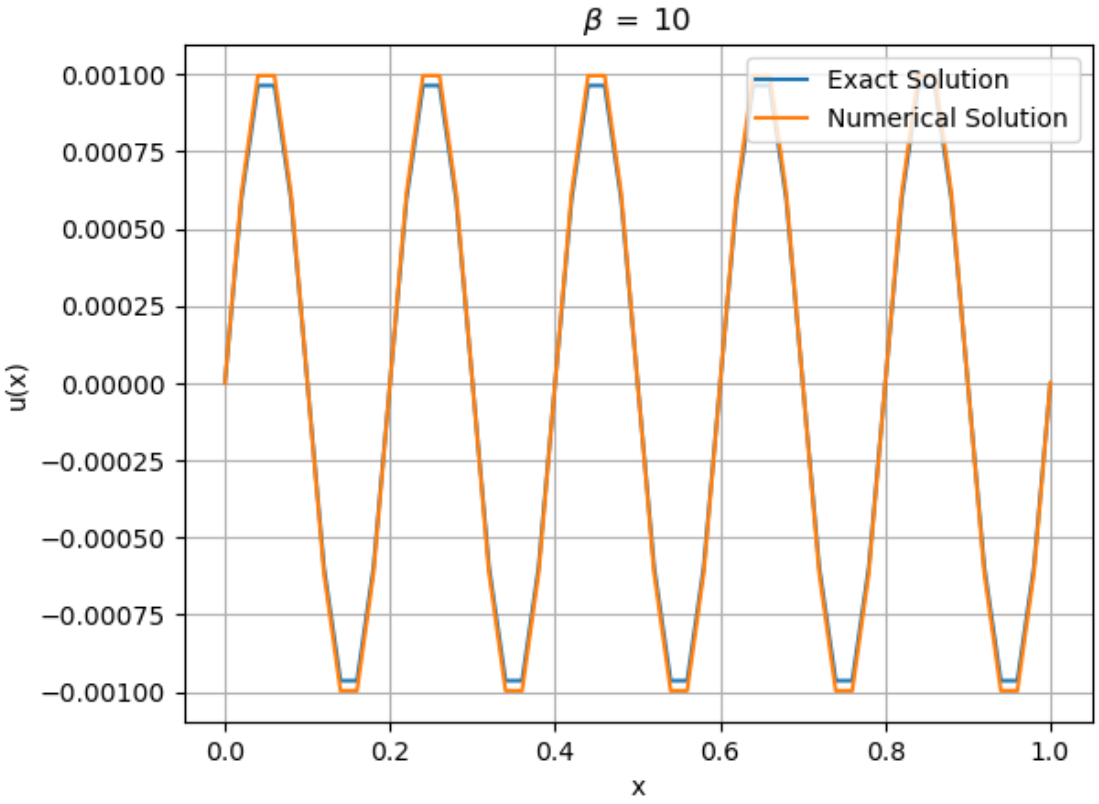
[2]:
```
Input_File = open("Values_of_Beta.txt", "r")
beta_s = []
for line in Input_File:
    if line[0] != "/" and (not line[0].isspace()):
        beta_s.append(line)
Input_File.close()
```

[3]:
```
beta_num = []
for beta in beta_s:
    beta_num.append(float(beta.strip()))
```

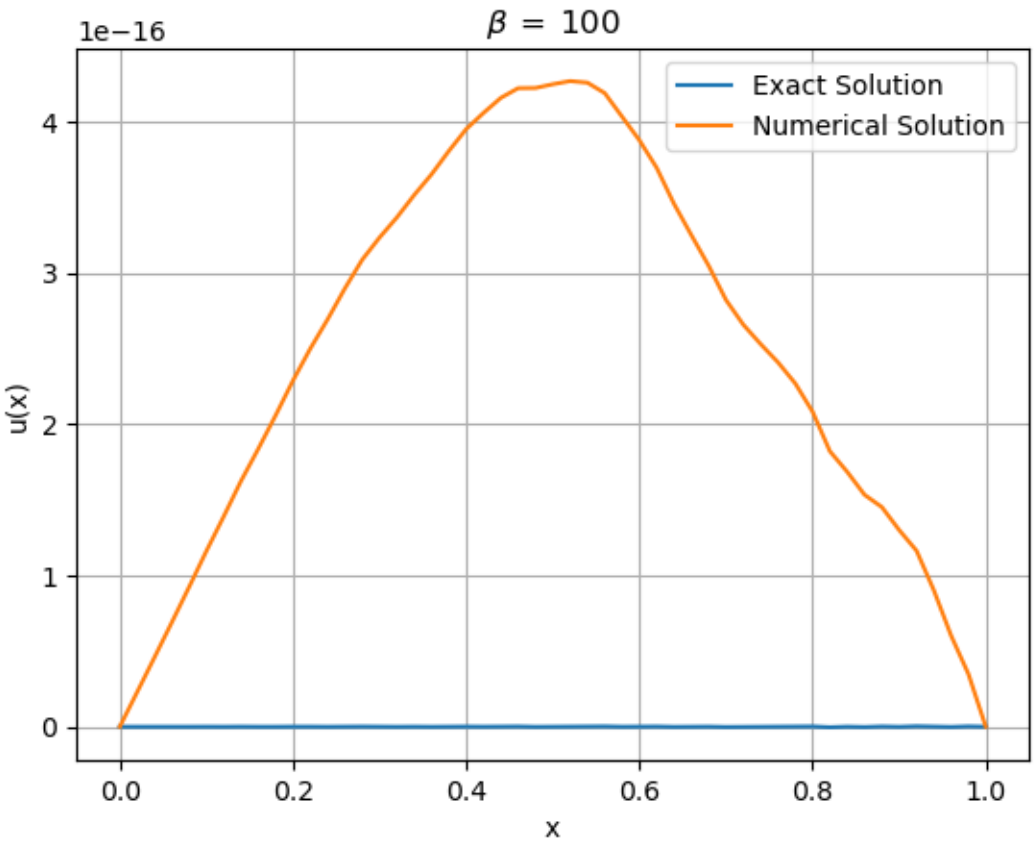
[4]:
```
fig = plt.figure()
Grid_N_1 = pd.read_csv("Q_1_b_Grid_Points_beta_is_1.000000.csv", delimiter =␣
 ↪",",header=None).to_numpy()
U_Exact_N_1 = pd.read_csv("Q_1_b_Exact_Solution_beta_is_1.000000.csv",␣
 ↪delimiter = ",",header=None).to_numpy()
U_Solution_N_1 = pd.read_csv("Q_1_b_Numerical_Solution_beta_is_1.000000.csv",␣
 ↪delimiter = ",",header=None).to_numpy()
plt.plot(Grid_N_1,U_Exact_N_1)
plt.plot(Grid_N_1,U_Solution_N_1)
plt.legend(["Exact Solution","Numerical Solution"])
plt.xlabel("x")
plt.ylabel("u(x)")
plt.title(r"$\beta\:=\:1$")
plt.grid()
plt.show()
fig.savefig("Q_1_b_beta_is_1_u_vs_x.png",dpi = 500, bbox_inches="tight")
```



[5]:
```
fig = plt.figure()
Grid_N_10 = pd.read_csv("Q_1_b_Grid_Points_beta_is_10.000000.csv", delimiter =␣
 ↪",",header=None).to_numpy()
U_Exact_N_10 = pd.read_csv("Q_1_b_Exact_Solution_beta_is_10.000000.csv",␣
 ↪delimiter = ",",header=None).to_numpy()
U_Solution_N_10 = pd.read_csv("Q_1_b_Numerical_Solution_beta_is_10.000000.csv",␣
 ↪delimiter = ",",header=None).to_numpy()
plt.plot(Grid_N_10,U_Exact_N_10)
plt.plot(Grid_N_10,U_Solution_N_10)
plt.legend(["Exact Solution","Numerical Solution"])
plt.xlabel("x")
plt.ylabel("u(x)")
plt.title(r"$\beta\:=\:10$")
plt.grid()
plt.show()
fig.savefig("Q_1_b_beta_is_10_u_vs_x.png",dpi = 500, bbox_inches="tight")
```



[6]:
```
fig = plt.figure()
Grid_N_100 = pd.read_csv("Q_1_b_Grid_Points_beta_is_100.000000.csv", delimiter␣
 ↪= ",",header=None).to_numpy()
U_Exact_N_100 = pd.read_csv("Q_1_b_Exact_Solution_beta_is_100.000000.csv",␣
 ↪delimiter = ",",header=None).to_numpy()
U_Solution_N_100 = pd.read_csv("Q_1_b_Numerical_Solution_beta_is_100.000000.
 ↪csv", delimiter = ",",header=None).to_numpy()
plt.plot(Grid_N_100,U_Exact_N_100)
plt.plot(Grid_N_100,U_Solution_N_100)
plt.legend(["Exact Solution","Numerical Solution"])
plt.xlabel("x")
plt.ylabel("u(x)")
plt.title(r"$\beta\:=\:100$")
plt.grid()
plt.show()
fig.savefig("Q_1_b_beta_is_100_u_vs_x.png",dpi = 500, bbox_inches="tight")
```


$\beta = 100$
1e−16
Exact Solution
Numerical Solution
u(x)
x
0
1
2
3
4
0.0
0.2
0.4
0.6
0.8
1.0