CMPT 423/820   ¶

Assignment 1 Question 5

- Seyedeh Mina Mousavifar
- 11279515
- sem311

In this question, some basic work with MatPlotLib.

```
In [1]:  # this is the conventional import
         import numpy as np
         import matplotlib.pyplot as plt
```

Data sets

In the cell below, three data sets are generated using Numpy. Make sure you understand what the code is doing!

```
In [2]:  # x-coordinates
         xs = np.linspace(0.0, 4.0)

         # 3 sets of y-coordinates
         y1 = np.cos(2 * np.pi * xs) * np.exp(-xs)
         y2 = np.cos(2 * np.pi * xs)
         y3 = np.sin(3 * np.pi * xs)
```

Task 1

Plot the three data sets (xs vs y1 , xs vs y2 , xs vs y3) on the same set of axes. Make the plot look good, choosing colours, giving labels for horizontal and vertical axes, and a title. Add a legend. Marks will be deducted for careless presentation.

```
In [3]:  # setting bigger size than default plot size
         plt.figure(figsize=(12, 4))

         # plotting y1
         plt.plot(xs, y1, 'k', label=r'$cos(2πx)e^{-x}$')

         # plotting y2
         plt.plot(xs, y2, 'g', label=r'$cos(2πx)$')

         # plotting y3
         plt.plot(xs, y3, 'y', label=r'$sin(3πx)$')

         # setting axis range [lowx highx lowy highy]
         plt.axis([0, 4, -1, 1])

         # adding x axis label
         plt.xlabel('x axis')

         # adding y axis abel
         plt.ylabel('y axis')

         # adding plot title
         plt.title('Trigonometric functions plot', fontweight='bold')

         # showing plot legend and adjust it outside of plot
         plt.legend(bbox_to_anchor= (1.01, 1.01), ncol=1,
                     borderaxespad=0)
         # showing plot, although jupyter calls this function implicitly
         plt.show()
```
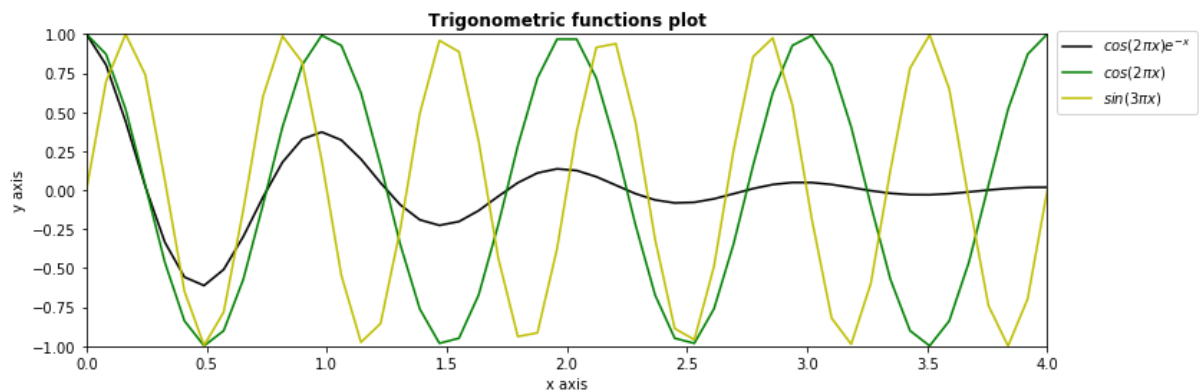

Task 2

Plot the three data sets (`xs vs y1` , `xs vs y2` , `xs vs y3`) on three independent axes, **horizontally** arranged. Make the plots look good, choosing colours, giving labels for horizontal and vertical axes, and a title. Marks will be deducted for careless presentation.

```
In [4]: # setting bigger size than default plot size
        plt.figure(figsize=(12, 4))

        # the three numbers are (number of plots vertically, number of plot hori
        zontally, which plot is this plot)
        plt.subplot(131)
        plt.plot(xs, y1, 'k', label=r'$cos(2πx)e^{-x}$')
        plt.axis([0, 4, -1, 1])
        plt.xlabel('x axis')
        plt.ylabel('y axis')
        plt.title(r'$cos(2πx)e^{-x}$')

        plt.subplot(132)
        plt.plot(xs, y2, 'g', label=r'$cos(2πx)$')
        plt.xlabel('x axis')
        plt.ylabel('y axis')
        plt.title(r'$cos(2πx)$')

        plt.subplot(133)
        plt.plot(xs, y3, 'y', label=r'$sin(3πx)$')
        plt.xlabel('x axis')
        plt.ylabel('y axis')
        plt.title(r'$sin(3πx)$')

        # for making plots not to intertwine with each other
        plt.tight_layout()

        plt.show()
```
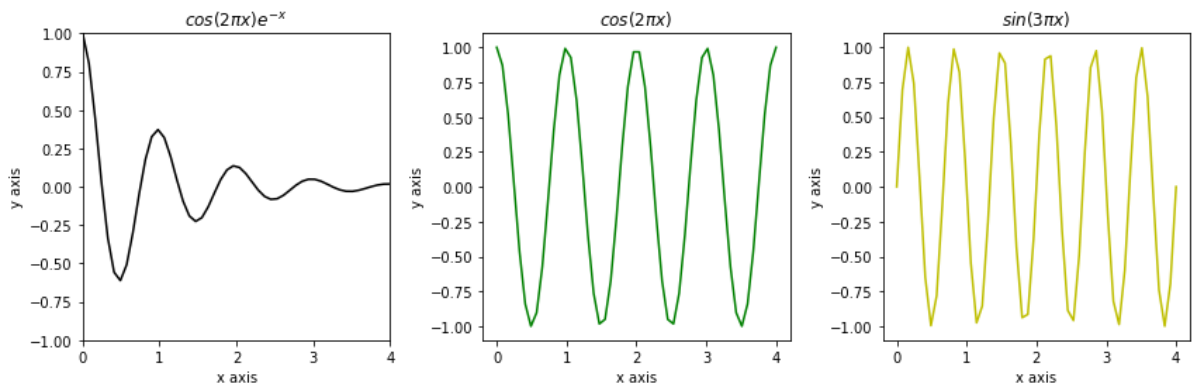

Task 3

Plot the three data sets (`xs vs y1` , `xs vs y2` , `xs vs y3`) on three independent axes, **vertically**
arranged. Make the plots look good, choosing colours, giving labels for horizontal and vertical axes, and a title.
Marks will be deducted for careless presentation.

```
In [5]: plt.figure(figsize=(12, 4))

        # the three numbers are (number of plots vertically, number of plot hori
        zontally, which plot is this plot)
        plt.subplot(311)
        plt.plot(xs, y1, 'r', label=r'$cos(2πx)e^{-x}$')
        plt.axis([0, 4, -1, 1])
        plt.xlabel('x axis')
        plt.ylabel('y axis')
        plt.title(r'$cos(2πx)e^{-x}$')

        plt.subplot(312)
        plt.plot(xs, y2, 'g', label=r'$cos(2πx)$')
        plt.xlabel('x axis')
        plt.ylabel('y axis')
        plt.title(r'$cos(2πx)$')

        plt.subplot(313)
        plt.plot(xs, y3, 'y', label=r'$sin(3πx)$')
        plt.xlabel('x axis')
        plt.ylabel('y axis')
        plt.title(r'$sin(3πx)$')

        plt.tight_layout(pad=0.4, h_pad=0.25)

        plt.show()
```
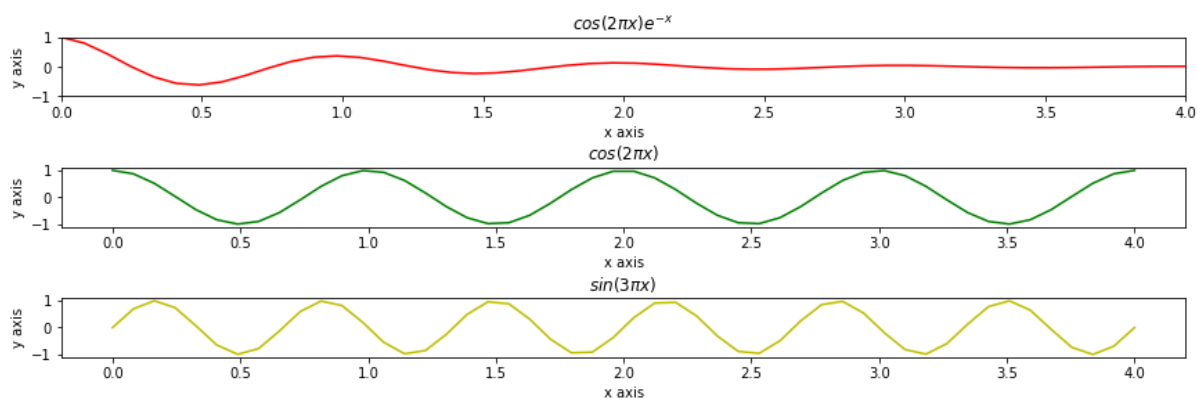

What to hand in

Your version of this notebook named A1Q5.pdf, containing completed work above, and your name and student number at the top.

Evaluation:

- 3 marks: Your plot for task 1 shows the 3 data sets on a single set of axes. The plot has labels, a title, and a legend.
- 3 marks: Your plot for task 2 shows the 3 data sets on individual axes arranged horizontally. The plots have labels, and there is a title. It looks good.
- 3 marks: Your plot for task 3 shows the 3 data sets on individual axes arranged vertically. The plots have labels, and there is a title. It looks good.