

CMPT 423/820

Assignment 1 Question 5

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In this question, some basic work with Matplotlib.

```
In [127]: # 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 [128]: # 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 (x s vs y_1 , x s vs y_2 , x s vs y_3) 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 [129]: # setting bigger size than default plot size
plt.figure(figsize=(12, 4))

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

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

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

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

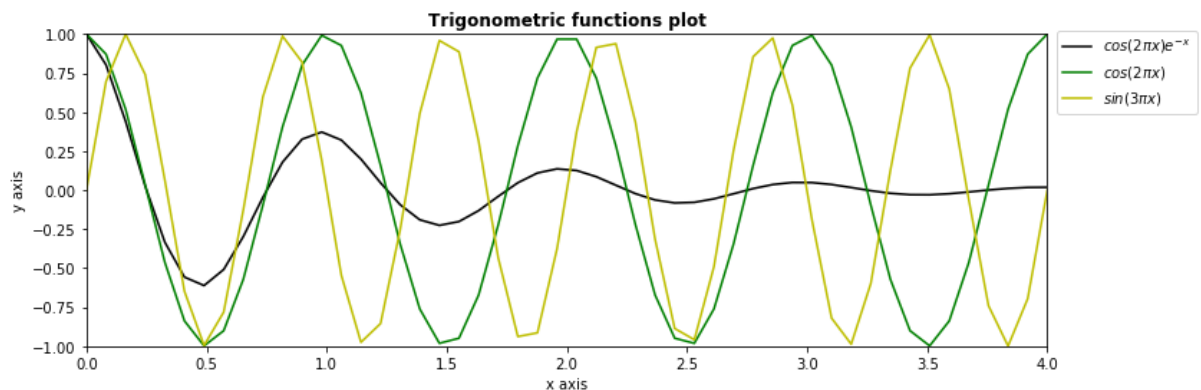
# adding x axis label
plt.xlabel('x axis')

# adding y axis label
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 (x vs y_1 , x vs y_2 , x vs y_3) 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 [130]: # 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'$\cos(2\pi x)e^{-x}$')
plt.axis([0, 4, -1, 1])
plt.xlabel('x axis')
plt.ylabel('y axis')
plt.title(r'$\cos(2\pi x)e^{-x}$')

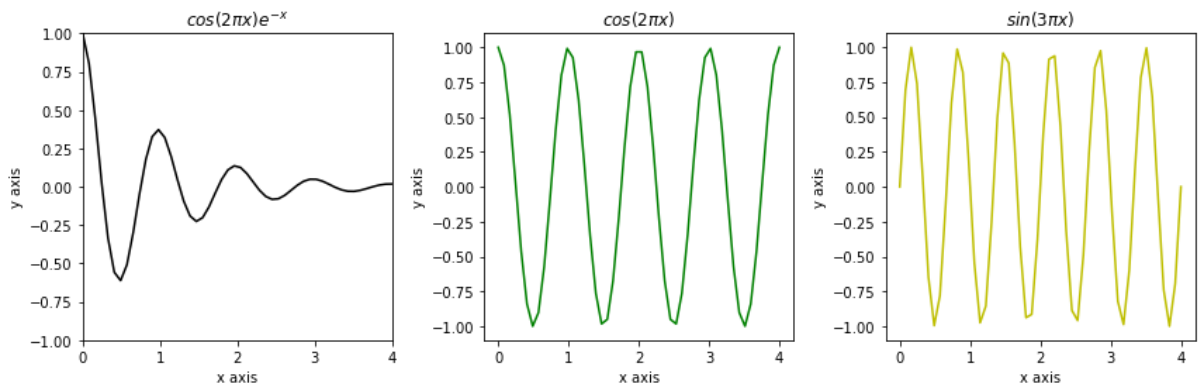
plt.subplot(132)
plt.plot(xs, y2, 'g', label=r'$\cos(2\pi x)$')
plt.xlabel('x axis')
plt.ylabel('y axis')
plt.title(r'$\cos(2\pi x)$')

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

# 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 [131]: 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'$\cos(2\pi x)e^{-x}$')
plt.axis([0, 4, -1, 1])
plt.xlabel('x axis')
plt.ylabel('y axis')
plt.title(r'$\cos(2\pi x)e^{-x}$')

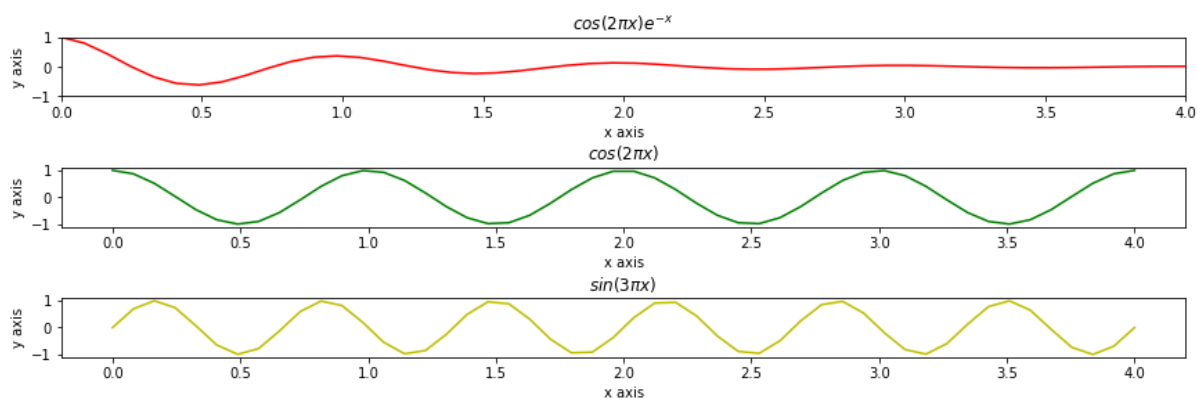
plt.subplot(312)
plt.plot(xs, y2, 'g', label=r'$\cos(2\pi x)$')
plt.xlabel('x axis')
plt.ylabel('y axis')
plt.title(r'$\cos(2\pi x)$')

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

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.