



Matlab Final Project

UNIVERSITY OF TEHRAN

Primary Matlab Course, Mr.Gholampour

Topic : Coding and editing function plots and bars

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Summer 1403

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1. Coding plots for math functions

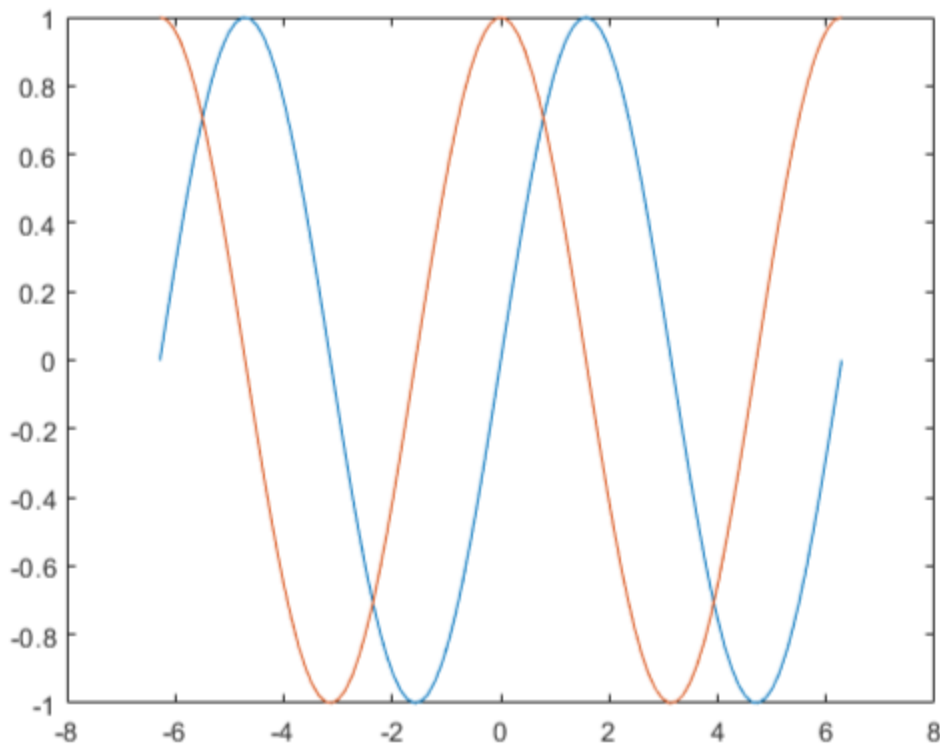
1.1) Plots

Plot(X,Y) creates a 2-D line plot of the data in Y versus the corresponding values in X.

To create plots we identify the limits of variable and then call the plot order.

```
x = linspace(-2*pi,2*pi);  
y1 = sin(x);  
y2 = cos(x);
```

```
figure  
plot(x,y1,x,y2)
```



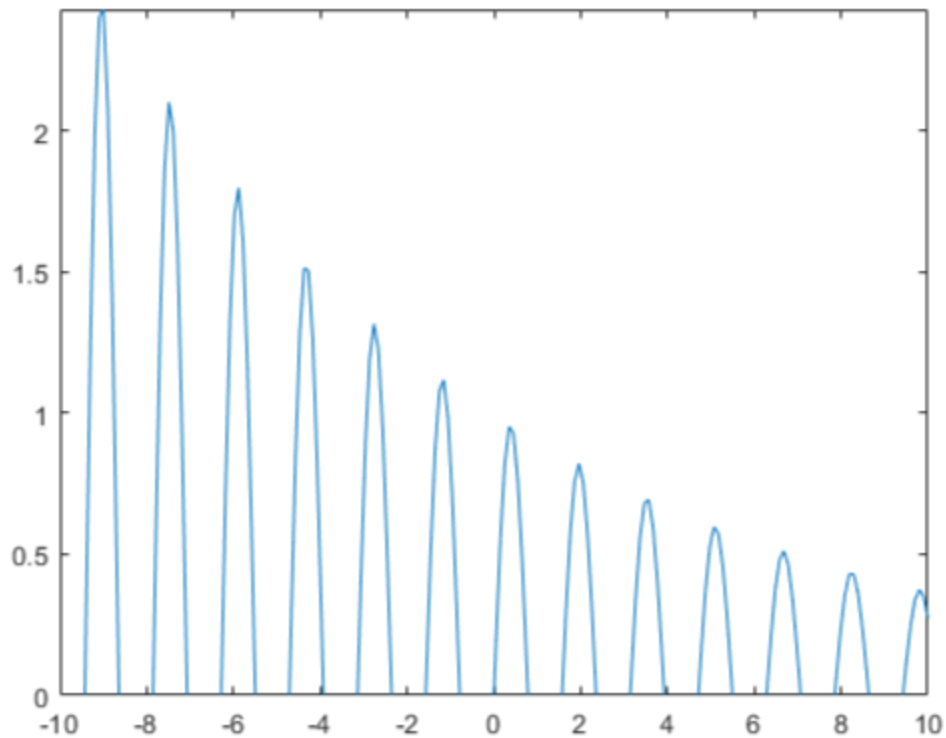
(1)

1.2) Axis

`axis(limits)` specifies the limits for the current axes. Specify the limits as vector of four, six, or eight elements.

The axis order receives the coordinates and makes changes to the plot you have created.

```
x = linspace(-10,10,200);  
y = sin(4*x)./exp(.1*x);  
plot(x,y)  
axis([-10 10 0 inf])
```

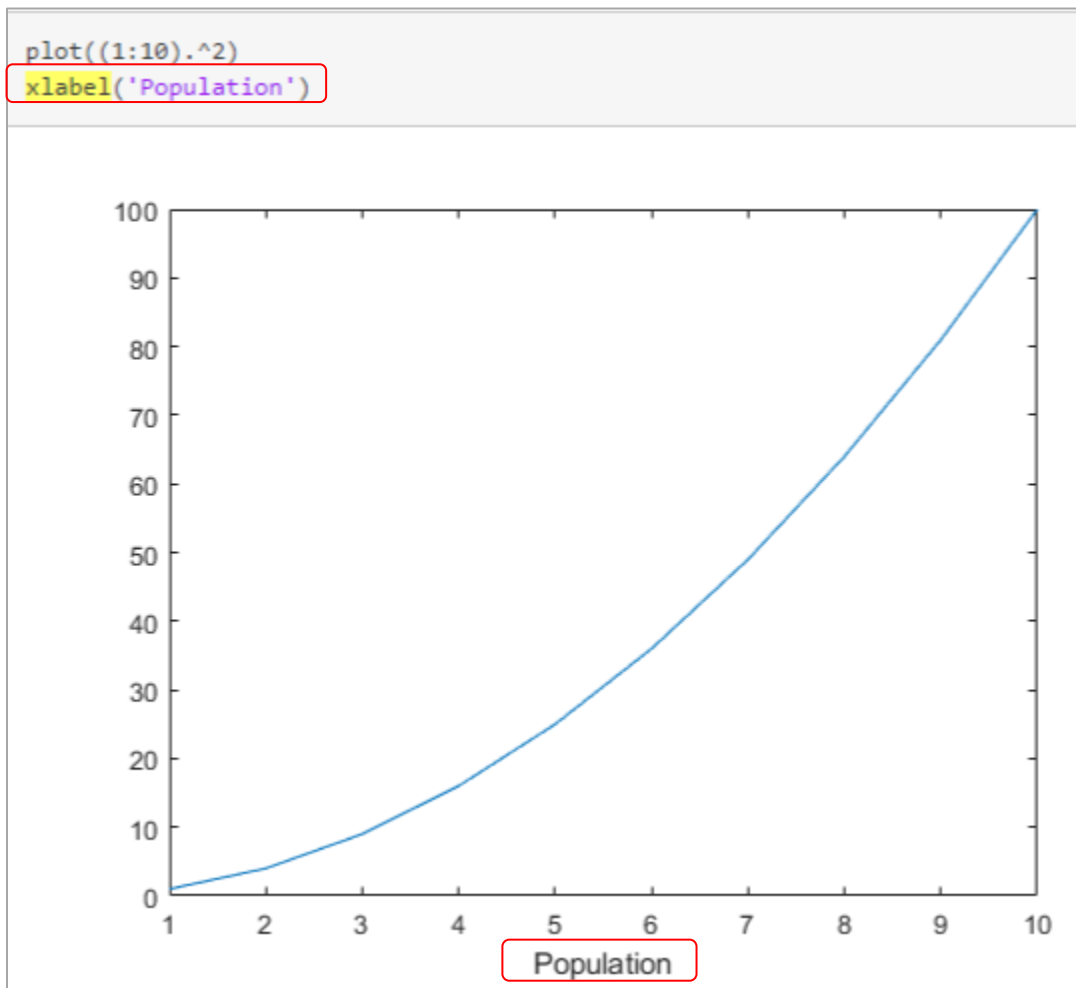


(2)

1.3) Lables

1.3-1) xlabel

`xlabel(txt)` labels the x-axis of the current axes or chart returned by the `gca` command. Reissuing the `xlabel` command replaces the old label with the new label.

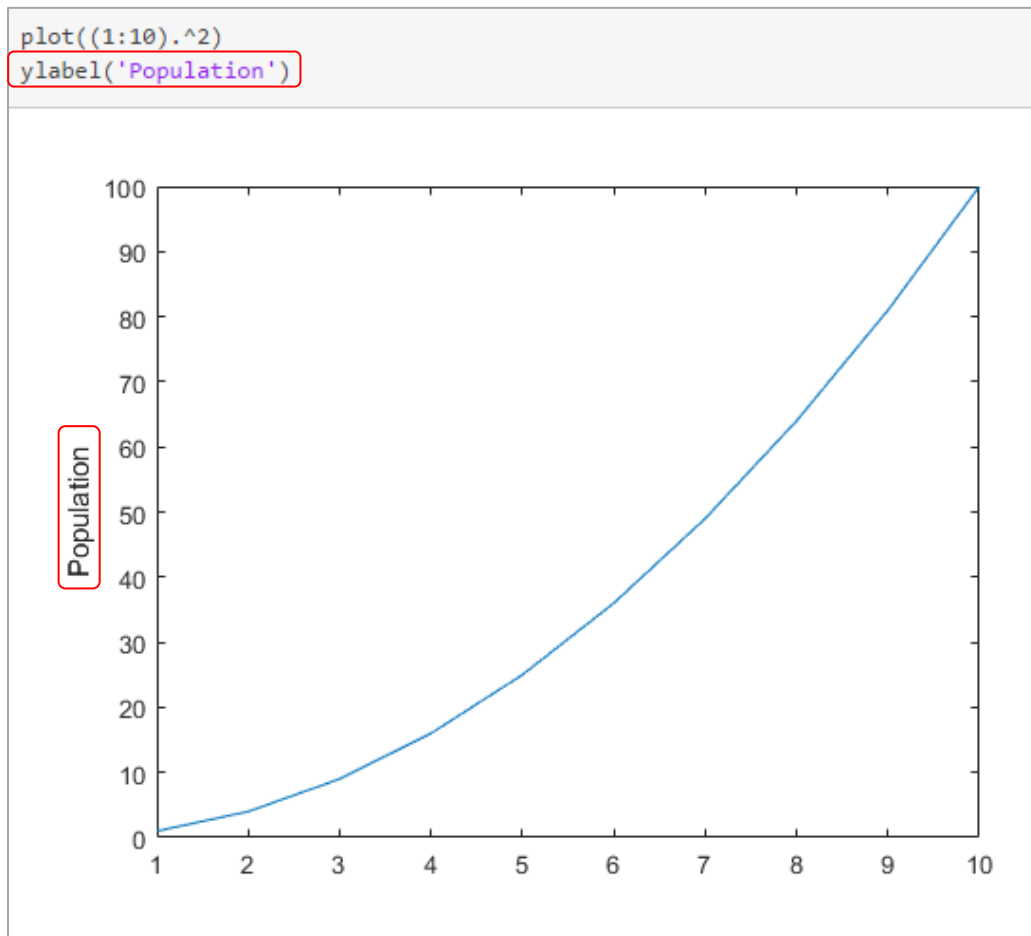


(3)

1.1) Lables

1.3-2) ylabel

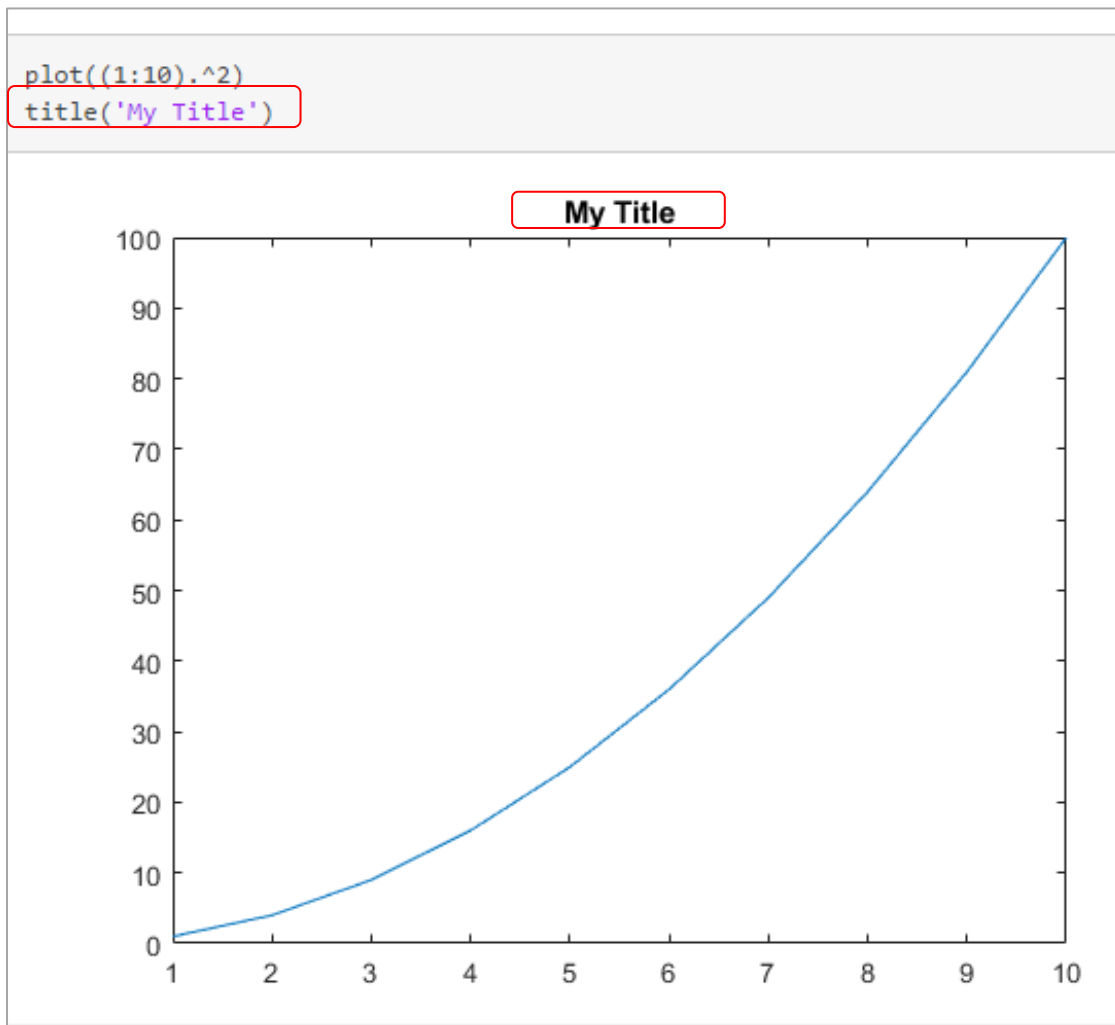
`ylabel(txt)` labels the y-axis of the current axes or chart returned by the `gca` command. Reissuing the `ylabel` command causes the new label to replace the old label.



(4)

1.4) Title

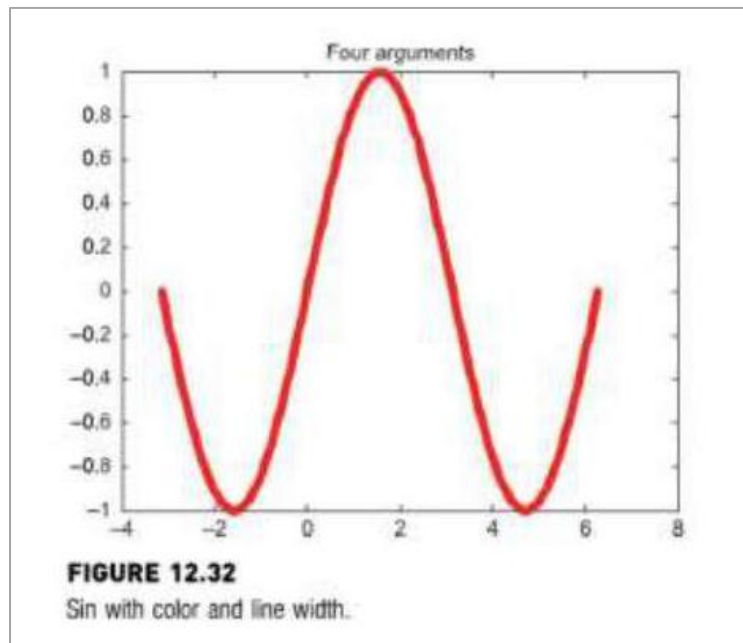
`title(txt)` adds the specified title to the axes or chart returned by the `gca` command. Reissuing the title command causes the new title to replace the old title.



(5)

➤ Question 1

Write a script in Matlab to create the plot below.



(6)

★ Answer

We follow these steps to solve it :

1. Assigning the limits
2. Calling the Sin function
3. Making a plot
4. Changing the color to red and putting a line width
5. Identifying the “axis”
6. Naming the labels and title

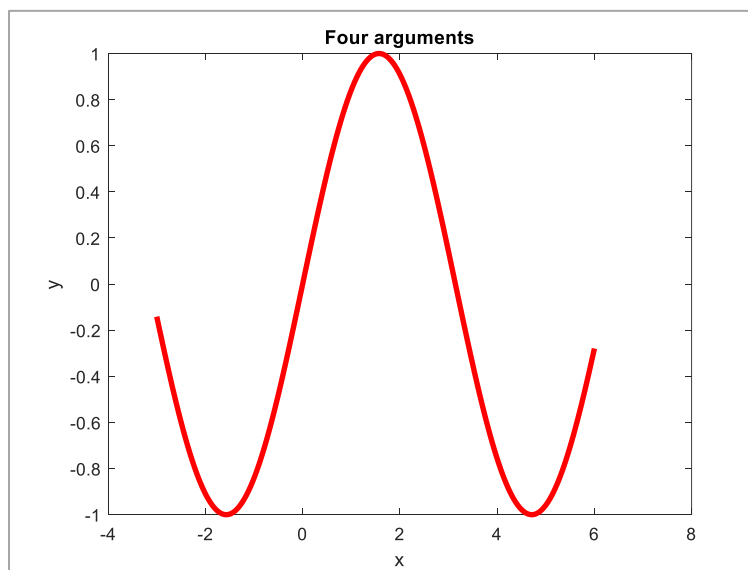
- The Matlab script of question 1

```
1 - clear all
2 - close all
3 - clc
4
5 - x=-3:0.01:6;
6
7 - for i=1:length(x)
8 -     y(i)=sin(x(i));
9 - end
10
11 - plot(x,y,'r','LineWidth',3)
12 - axis([-4 8 -1 1])
13 - xlabel('x')
14 - ylabel('y')
15 - title('Four arguments')
16
```

(7)

The red box includes orders that were discussed in previous pages.

Now this is the result of the code :

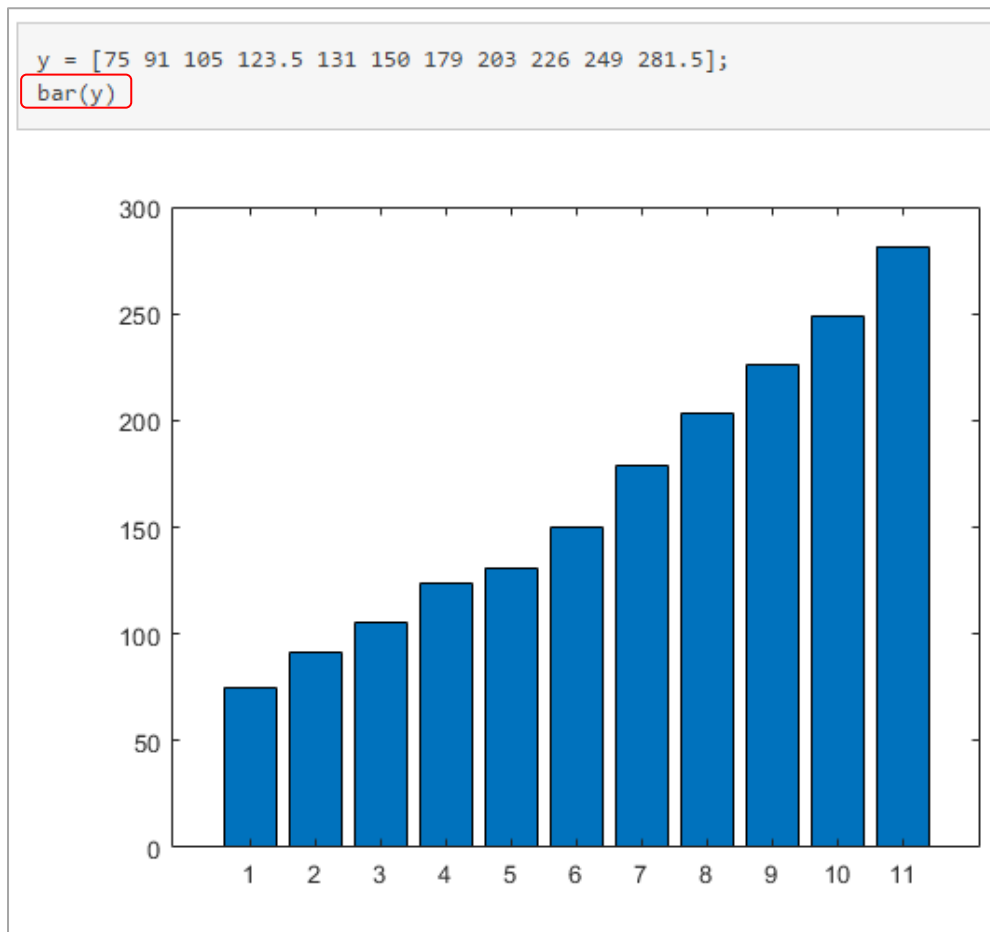


(8)

2. Coding a bar and editing it

2.1) Bar

`bar(y)` creates a bar graph with one bar for each element in `y`. If `y` is a matrix, then `bar` groups the bars according to the rows in `y`.
`bar(x,y)` draws the bars at the locations specified by `x`.



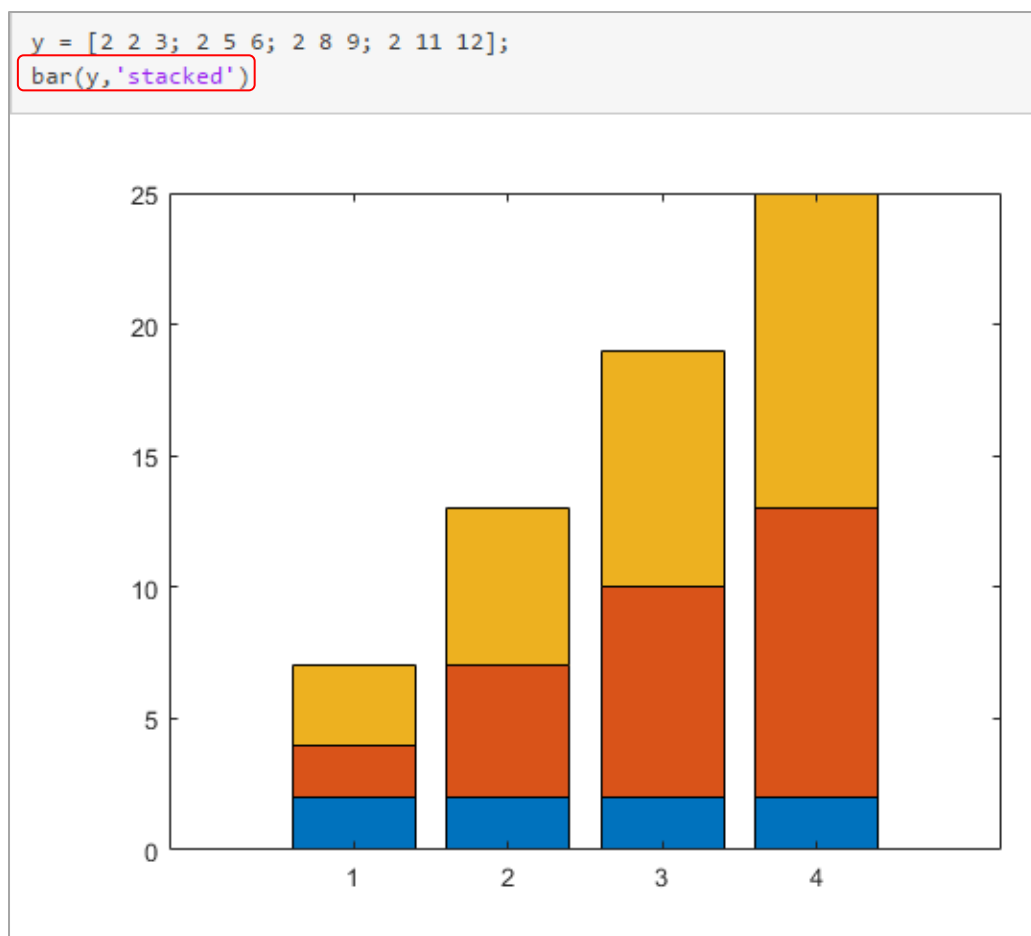
(9)

2.2) Barh

By adding a 'h' at the end of bar order (barh) the becomes horizontal. In question 2 there is a good example of horizontal bars.

2.3) Stacked bar

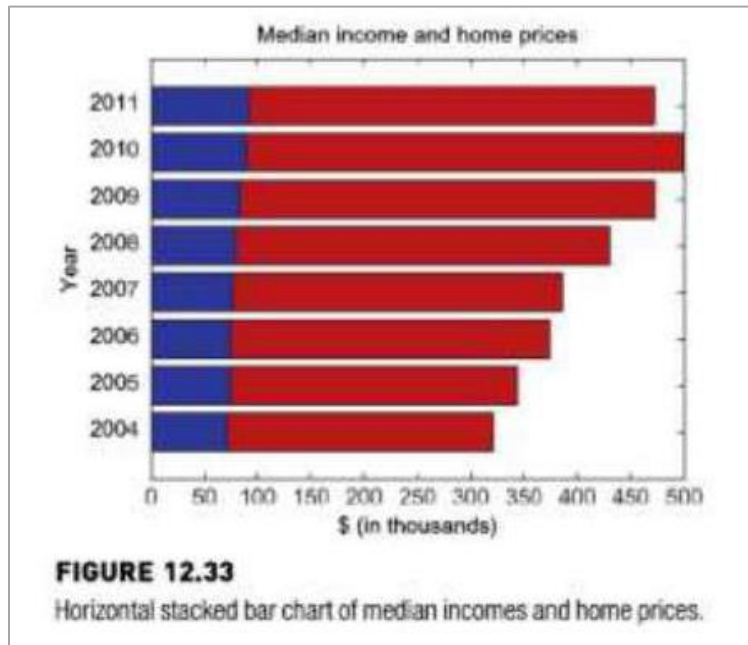
When creating bars we can use the 'stacked' order. Display one bar for each row of the matrix. The height of each bar is the sum of the elements in the row.



(10)

➤ Question 2

Write a script in Matlab to create the horizontal bar below.



(11)

★ Answer

We follow these steps to solve it :

1. Assigning the limits and data
2. Making a horizontal bar
3. Displaying "barh" as "stacked"
4. Naming the labels and title

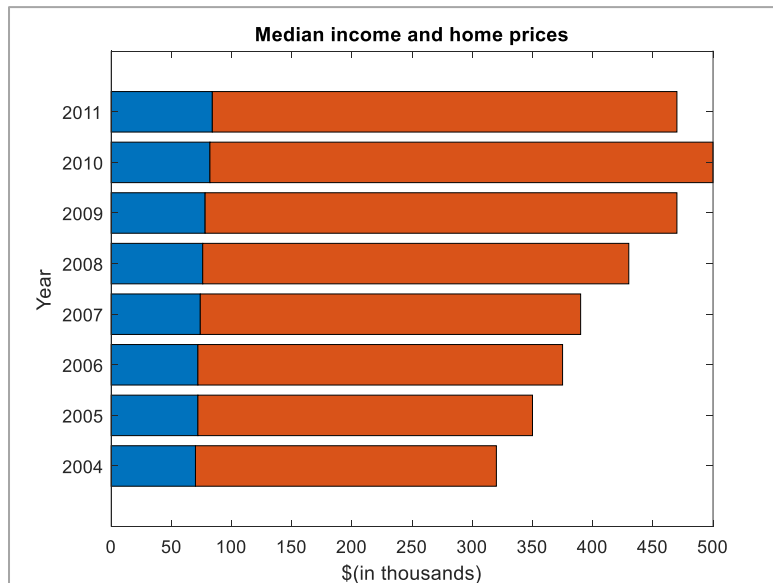
- The Matlab script of question 2

```
1 - clear all
2 - close all
3 - clc
4 - |
5 - x= 2004:2011;
6 - y=[70 250;72 278;72 303;74 316;76 354;78 392;82 418;84 386];
7 -
8 - disp(barh(x,y,'stacked'))
9 -
10 - xlabel('$ (in thousands)')
11 - ylabel('Year')
12 - title('Median income and home prices')
13 -
```

(12)

This is a good example of the usage of “barh” and “stacked” orders.

Now let’s check the result :



(13)

3. Coding a Patch using coordinates

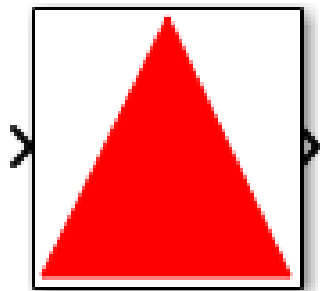
3.1) Patch

`patch(x, y)` creates a solid patch having the shape specified by the coordinate vectors `x` and `y`. The patch's color is the current foreground color.

`patch(x, y, [r g b])` creates a solid patch of the color specified by the vector `[r g b]`, where `r` is the red component, `g` the green, and `b` the blue.

```
patch([0 .5 1], [0 1 0], [1 0 0])
```

creates a red triangle on the mask's icon.

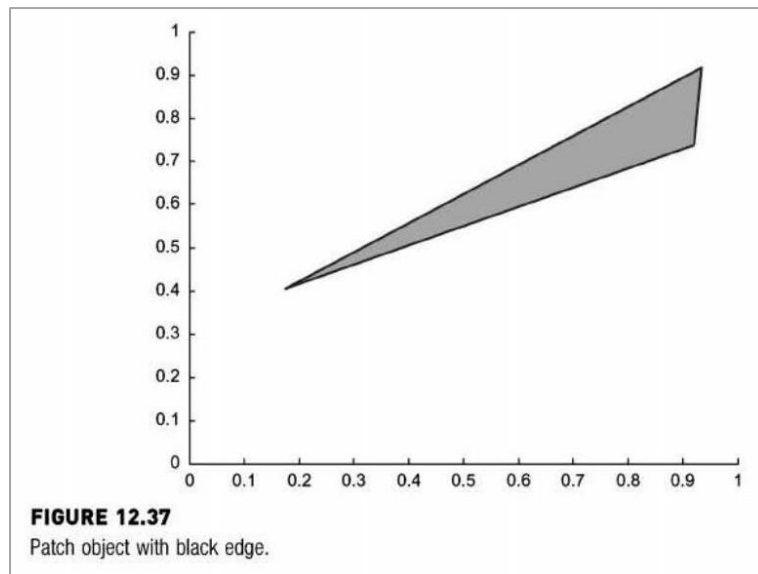


Pyramid

(14)

➤ Question 3

Write a script in Matlab to create the patch object below.



(15)

★ Answer

We follow these steps to solve it :

1. Giving 'x' coordinates
2. Giving 'y' coordinates
3. Identifying color properties (optional)
4. Calling "patch" order
5. Putting the edge color
6. Identifying the "axis"

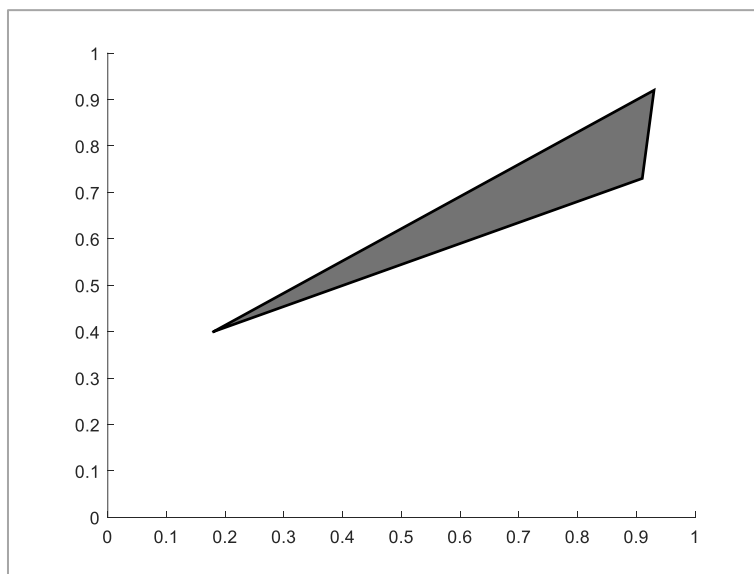
- The Matlab script of question 3

```
1 - clear all
2 - close all
3 - clc
4
5 - x=[0.18 0.91 0.93];
6 - y=[0.4 0.73 0.92];
7
8 - c=[0.45 0.45 0.45];
9
10 - patch(x,y,c,'Edgecolor','k','linewidth',1.5)
11 - axis([0 1 0 1])
```

(16)

Pay attention to the “edge color” order inside the patch order.

Let's check the result :



(17)

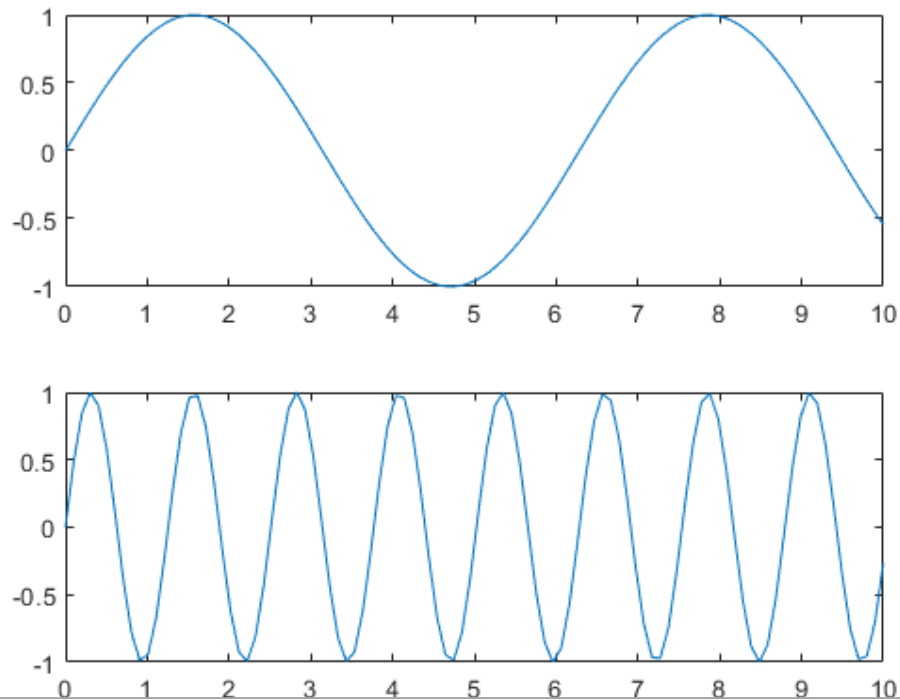
4. Coding curved rectangles

4.1) Subplot

`subplot(m,n,p)` divides the current figure into an m-by-n grid and creates axes in the position specified by p. MATLAB numbers subplot positions by row. The first subplot is the first column of the first row, the second subplot is the second column of the first row, and so on. If axes exist in the specified position, then this command makes the axes the current axes.

```
subplot(2,1,1);  
x = linspace(0,10);  
y1 = sin(x);  
plot(x,y1)
```

```
subplot(2,1,2);  
y2 = sin(5*x);  
plot(x,y2)
```



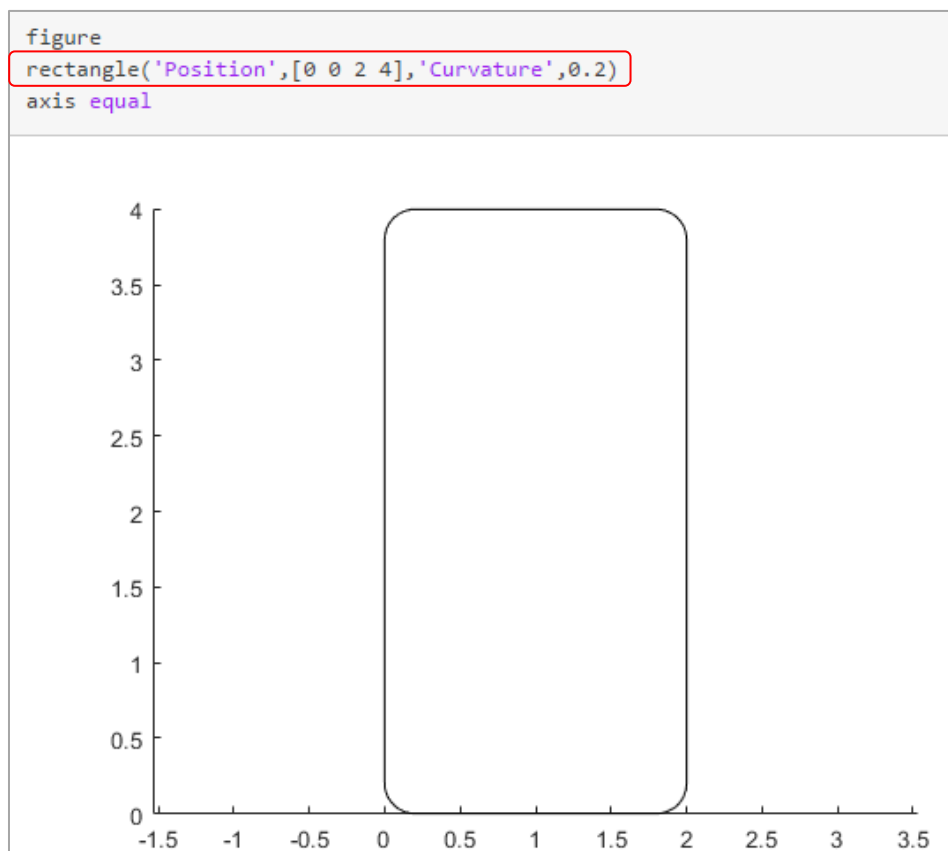
(18)

4.2) Rectangle

`rectangle('Position',pos)` creates a rectangle in 2-D coordinates. Specify `pos` as a four-element vector of the form `[x y w h]` in data units. The `x` and `y` elements determine the location and the `w` and `h` elements determine the size. The function plots into the current axes without clearing existing content from the axes.

4.3) Curvature

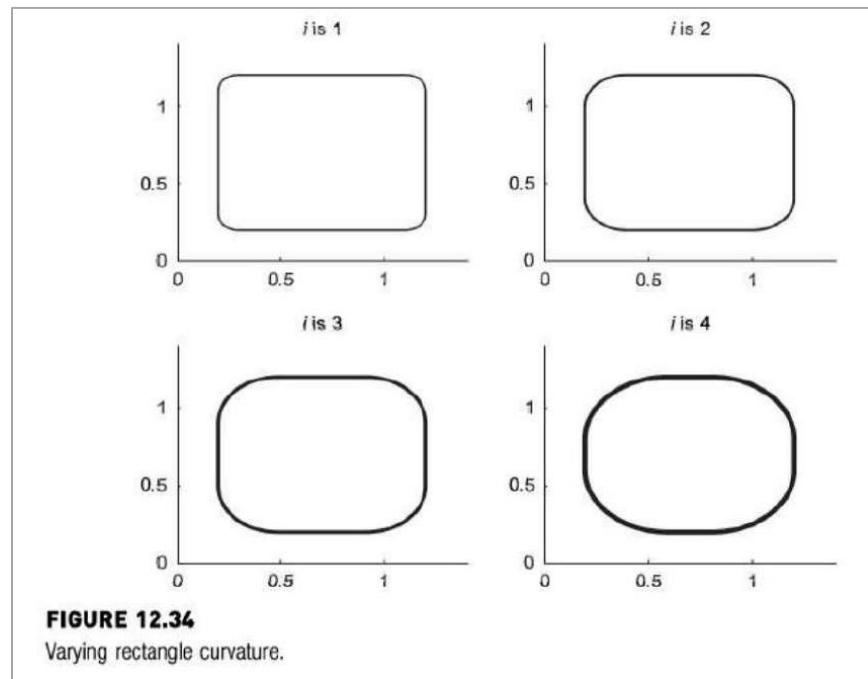
`rectangle('Position',pos,'Curvature',cur)` adds curvature to the sides of the rectangle. For different curvatures along the horizontal and vertical sides, specify `cur` as a two-element vector of the form `[horizontal vertical]`.



(19)

➤ Question 4

Write a script in Matlab to create the subplot below.



(20)

★ Answer

We follow these steps to solve it :

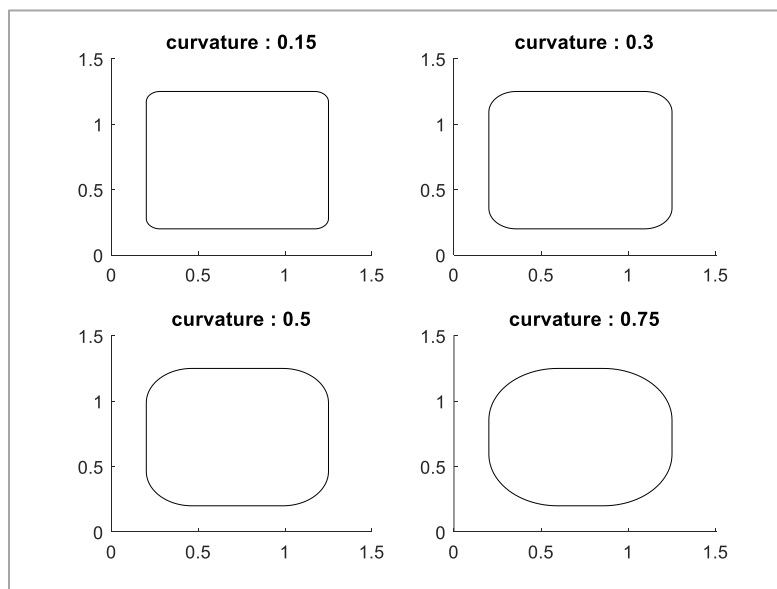
1. Create a “Subplot”
2. Make a rectangle using coordinates
3. Consider the “curvature” of the rectangle
4. Identify the “axis” and “title”
5. Do these for 3 other rectangles with different value of “curvature”

- The Matlab script of question 4

```
1 - clear all
2 - close all
3 - clc
4
5 - subplot(2,2,1)
6 - rectangle('Position',[.2 .2 1.05 1.05],'Curvature',0.15)
7 - axis([0 1.5 0 1.5])
8 - title('curvature : 0.15')
9
10 - subplot(2,2,2)
11 - rectangle('Position',[.2 .2 1.05 1.05],'Curvature',0.3)
12 - axis([0 1.5 0 1.5])
13 - title('curvature : 0.3')
14
15 - subplot(2,2,3)
16 - rectangle('Position',[.2 .2 1.05 1.05],'Curvature',0.5)
17 - axis([0 1.5 0 1.5])
18 - title('curvature : 0.5')
19
20 - subplot(2,2,4)
21 - rectangle('Position',[.2 .2 1.05 1.05],'Curvature',0.75)
22 - axis([0 1.5 0 1.5])
23 - title('curvature : 0.75')
```

(21)

The codes related to each rectangle are written below the ‘subplot’ order. Now we check the result :



(22)

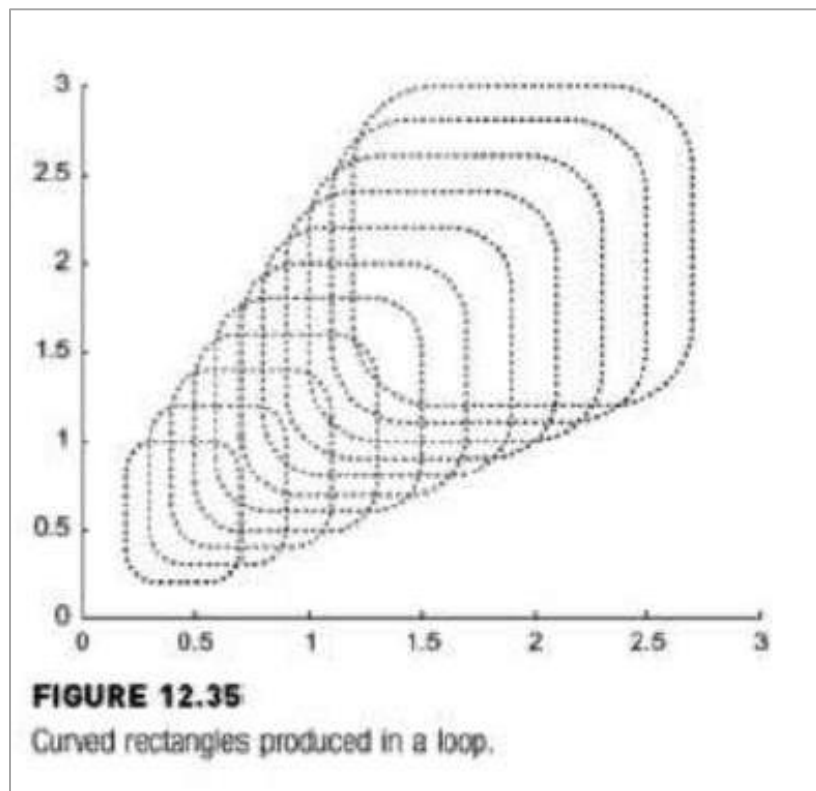
5. Coding a loop of curved rectangles

In this chapter there isn't any new order and all of the orders have been discussed before, but there are important points in the question.

So, let's get down to the question 5.

➤ Question 5

Write a script in Matlab to create the loop below.



(23)

★ Answer

We follow these steps to solve it :

1. Prompt the user for the number of rectangles
2. Identify the essential coordinates to make a rectangle
3. Create the “for” loop and identify the amount of change for coordinates in each level
4. Create the rectangle and mention “curvature” , “line style” and so forth

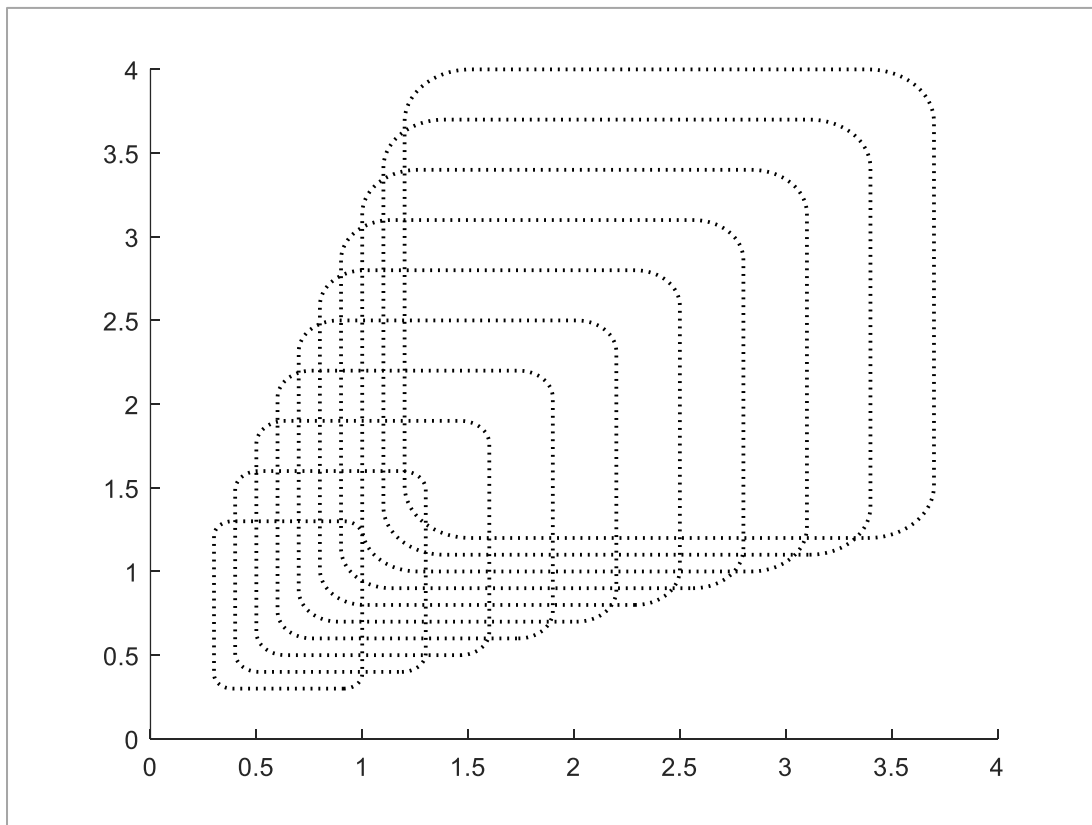
- The Matlab script of question 5

```
1 - clear all
2 - close all
3 - clc
4
5 - n=input('assign the number of rectangles : ');
6 - a=0.2; b=0.2; c=0.7; d=1;
7
8 - for i=1:n
9 -     a=a+0.1; b=b+0.1; c=c+0.2; d=d+0.2;
10
11 -     rectangle('Position',[a b c d],'Curvature',0.25,...
12 -         'linestyle',':','linewidth',1.45)
13
14 - end
```

(24)

By following the above steps the result will be like :

(For example the input value receives 10)



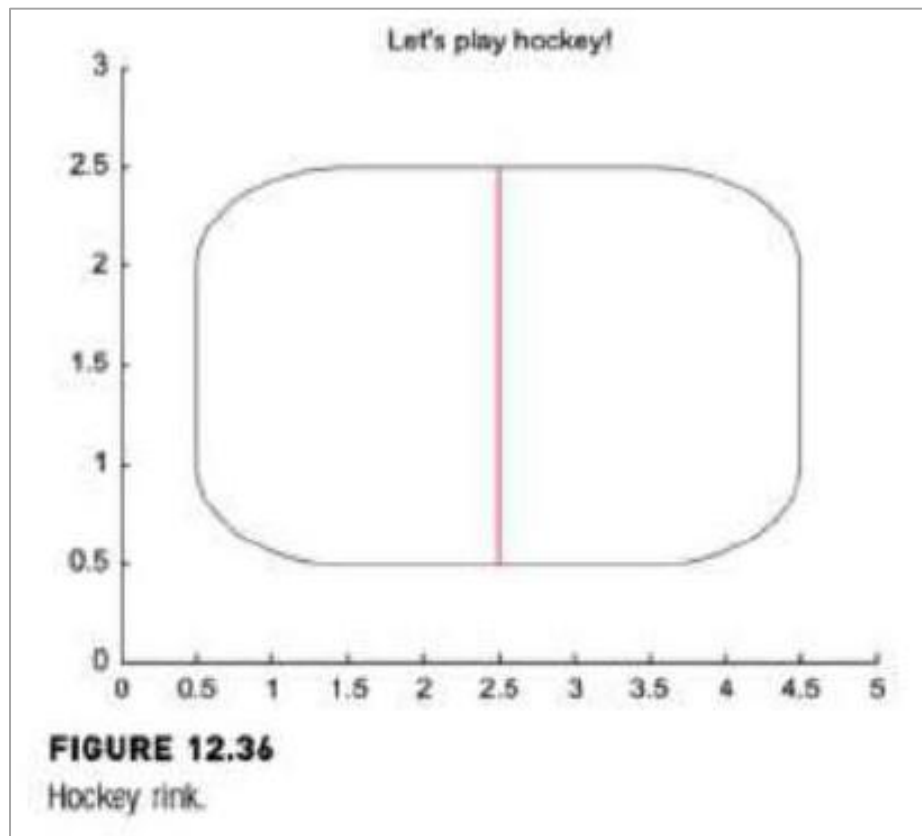
(25)

6. Coding a hockey rink

In this chapter there isn't any new order, either.
All of the orders have been discussed before, but there
are important points in the question.
So, let's get down to the question 6.

➤ Question 6

Write a script in Matlab to create the plot below.



(26)

★ Answer

We follow these steps to solve it :

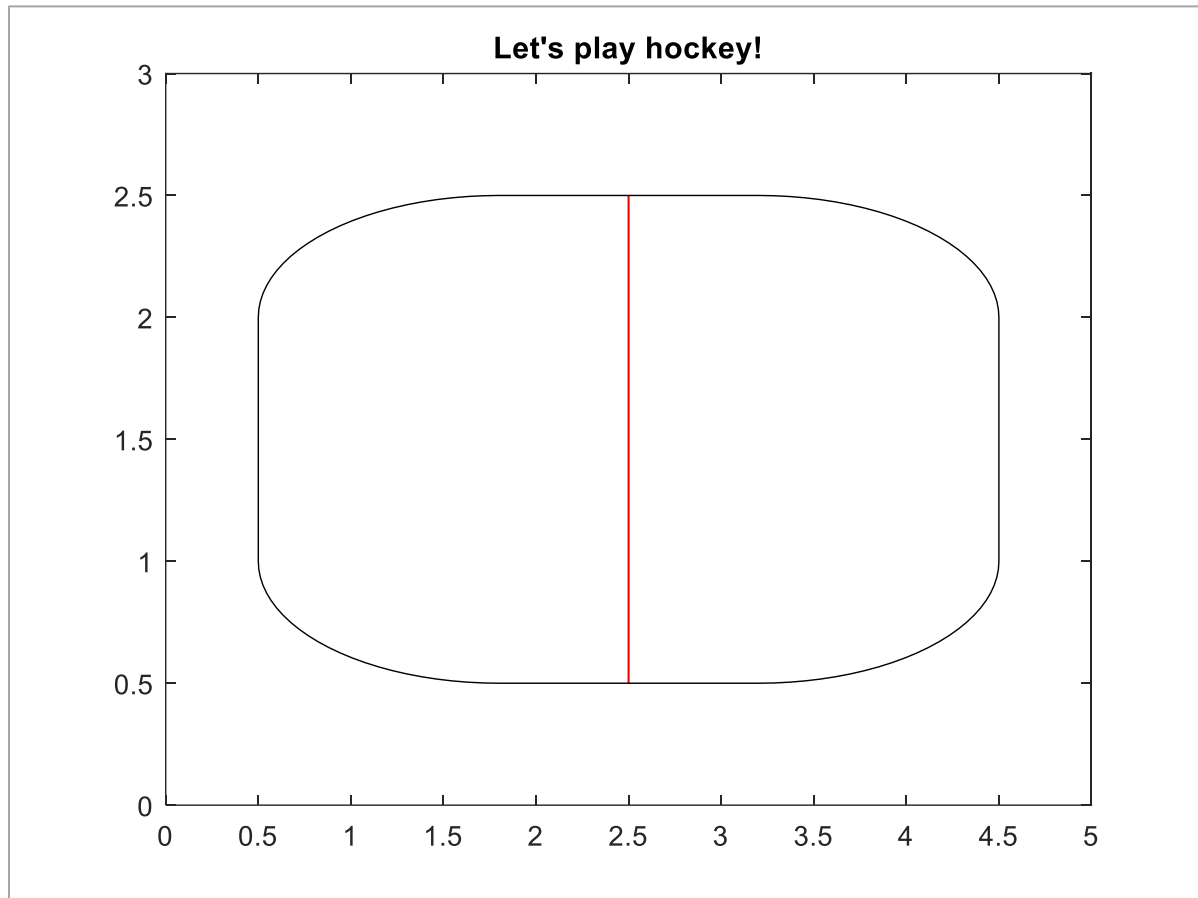
1. Assigning the limits
2. Creating a “for” loop
3. Creating a plot for the red line
4. Generating a rectangle
5. Mentioning the “curvature”, “axis”, and “title”

- The Matlab script of question 5

```
1 - clear all
2 - close all
3 - clc
4
5 - y=0.5:2.5;
6 - for i=1:length(y)
7 -     x(i)=2.5;
8 - end
9
10 - plot(x,y,'r','linewidth',1)
11 - rectangle('Position',[.5 .5 4 2],'Curvature',[0.65,0.5])
12 - axis([0 5 0 3])
13 - title("Let's play hockey!")
14 |
```

(27)

By following the above steps the result will be like :



(28)

Note : For creating this plot easier, the function of the red line in middle of the hockey rink must be created before calling the rectangle order.

❖ References

- Mathworks.com
- ChatGPT.com
- Matlab tutorial collected by MohammadAmin Gholampour
- Matlab application (R2017b)
 - The resources of all numbered pictures in this file (1-28) are Matlab app and Mathworks.com .

Thank you for your attention!

You have any questions or comments?

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