



NAVI MUMBAI

# MATLAB

## Unit 4-Lecture 12

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BTech (CSBS) -Semester VII

26 August 2022, 09:35AM



# Basic plotting

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- Overview,
- axis labels, and annotations,
- **creating simple plots,**
- specifying line styles and colours
- adding titles,
- multiple data sets in one plot,



# Overlay plot

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Method 1: Using the plot command to generate overlay plots

```
plot(x1,y1, x2,y2,':', x3,y3,'o')
```

Method 2: Using the hold command to generate overlay plots

```
% - Script file to generate an overlay plot with the hold command -
x = linspace(0,2*pi,100);          % Generate vector x
y1 = sin(x);                       % Calculate y1
plot(x,y1)                         % Plot (x,y1) with solid line
hold on                           % Invoke hold for overlay plots
y2 = x; plot(x,y2,'--')            % Plot (x,y2) with dashed line
y3 = x - (x.^3)/6 + (x.^5)/120;    % Calculate y3
plot(x,y3,'o')                    % Plot (x,y3) as pts. marked by 'o'
axis([0 5 -1 5])                  % Zoom in with new axis limits
hold off                          % Clear hold command
```



# Overlay plot

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## Method 3: Using the line command to generate overlay plots

```
% -- Script file to generate an overlay plot with the line command --
% -----
% First, generate some data
t = linspace(0,2*pi,100);      % Generate vector t
y1 = sin(t);                  % Calculate y1, y2, y3
y2 = t;
y3 = t - (t.^3)/6 + (t.^5)/120;

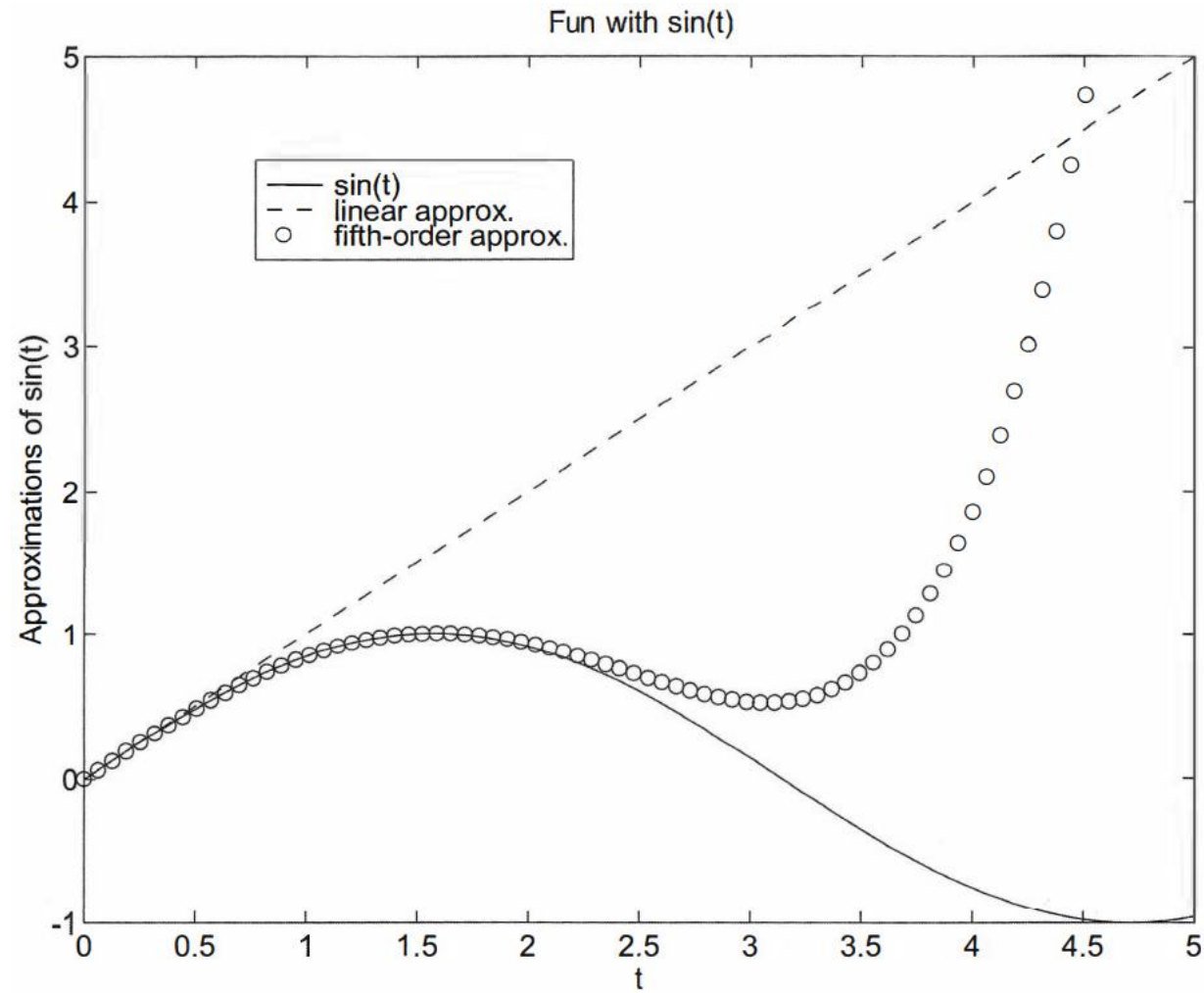
% Now, plot the three lines
plot(t,y1)                    % Plot (t,y1) with (default) solid line
line(t,y2,'linestyle','--')   % Add line (t,y2) with dashed line and
line(t,y3,'marker','o',...    % Add line (t,y3) plotted with circles--
      'linestyle', 'none')    % but no line
% Adjust the axes
axis([0 5 -1 5])              % Zoom in with new axis limits

% Dress up the graph
xlabel('t')                    % Put x-label
ylabel('Approximations of sin(t)') % Put y-label
title('Fun with sin(t)')      % Put title

legend('sin(t)', 'linear approx.', 'fifth-order approx.')
% add legend
```



# Overlay plot





## Specialized 2D plot

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|                       |   |
|-----------------------|---|
| <code>area</code>     | creates a filled area plot,               |
| <code>bar</code>      | creates a bar graph,                      |
| <code>barh</code>     | creates a horizontal bar graph,           |
| <code>comet</code>    | makes an animated 2-D plot,               |
| <code>compass</code>  | creates arrow graph for complex numbers,  |
| <code>contour</code>  | makes contour plots,                      |
| <code>contourf</code> | makes filled contour plots,               |
| <code>errorbar</code> | plots a graph and puts error bars,        |
| <code>feather</code>  | makes a feather plot,                     |
| <code>fill</code>     | draws filled polygons of specified color, |
| <code>fplot</code>    | plots a function of a single variable,    |





## Specialized 2D plot

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|                         |  |
|-------------------------|--|
| <code>fplot</code>      | plots a function of a single variable,                               |
| <code>hist</code>       | makes histograms,  |
| <code>loglog</code>     | creates plot with log scale on both the $x$ -axis and the $y$ -axis, |
| <code>pareto</code>     | makes pareto plots,  |
| <code>pcolor</code>     | makes pseudocolor plot of a matrix,                                  |
| <code>pie</code>        | creates a pie chart,   |
| <code>plotyy</code>     | makes a double $y$ -axis plot,                                       |
| <code>plotmatrix</code> | makes a scatter plot of a matrix,                                    |
| <code>polar</code>      | plots curves in polar coordinates,                                   |
| <code>quiver</code>     | plots vector fields,   |
| <code>rose</code>       | makes angled histograms,   |
| <code>scatter</code>    | creates a scatter plot,  |



## Specialized 2D plot

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`semilogx`

makes semilog plot with log scale on the  $x$ -axis,

`semilogy`

makes semilog plot with log scale on the  $y$ -axis,

`stairs`

plots a stair graph, and

`stem`

plots a stem graph.



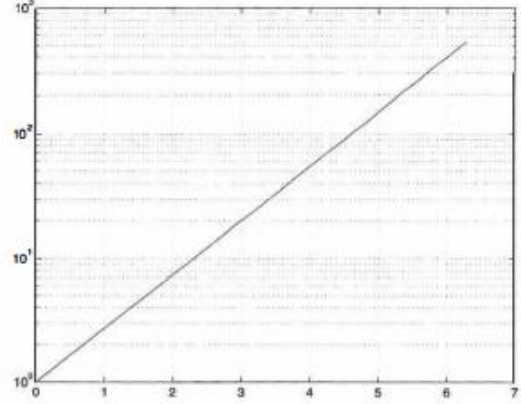
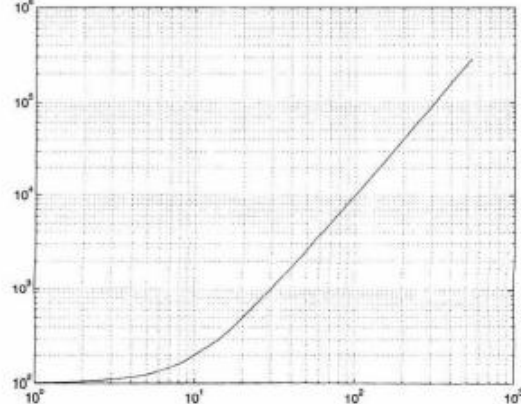


# Specialized 2D plot

| Function | Example Script  | Output |
|----------|---|--------|
| fplot    | $f(t) = t \sin t, \quad 0 \leq t \leq 10\pi$<br><code>fplot('x.*sin(x)',[0 10*pi])</code><br><p>Note that the function to be plotted must be written as a function of <math>x</math>.</p> |        |
| semilogx | $x = e^{-t}, \quad y = t, \quad 0 \leq t \leq 2\pi$<br><code>t = linspace(0,2*pi,200);</code><br><code>x = exp(-t); y = t;</code><br><code>semilogx(x,y), grid</code>                     |        |



# Specialized 2D plot

|          |  |  |
|----------|--|--|
| semilogy | $x = t, y = e^t, 0 \leq t \leq 2\pi$ <pre>t = linspace(0,2*pi,200);<br/>semilogy(t,exp(t))<br/>grid</pre>  |   |
| loglog   | $x = e^t, y = 100 + e^{2t}, 0 \leq t \leq 2\pi$ <pre>t = linspace(0,2*pi,200);<br/>x = exp(t);<br/>y = 100 + exp(2*t);<br/>loglog(x,y), grid</pre> |  |



# Specialized 2D plot

|       |  |  |
|-------|--|--|
| polar | $r^2 = 2 \sin 5t, \quad 0 \leq t \leq 2\pi$ <pre>t = linspace(0,2*pi,200);<br/>r = sqrt(abs(2*sin(5*t)));<br/>polar(t,r)</pre>   |  |
| fill  | $r^2 = 2 \sin 5t, \quad 0 \leq t \leq 2\pi$ $x = r \cos t, \quad y = r \sin t$ <pre>t = linspace(0,2*pi,200);<br/>r = sqrt(abs(2*sin(5*t)));<br/>x = r.*cos(t);<br/>y = r.*sin(t);<br/>fill(x,y,'k');<br/>axis('square')</pre> |  |

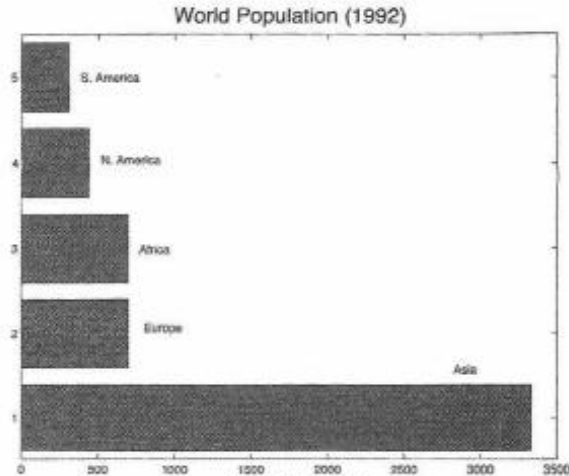
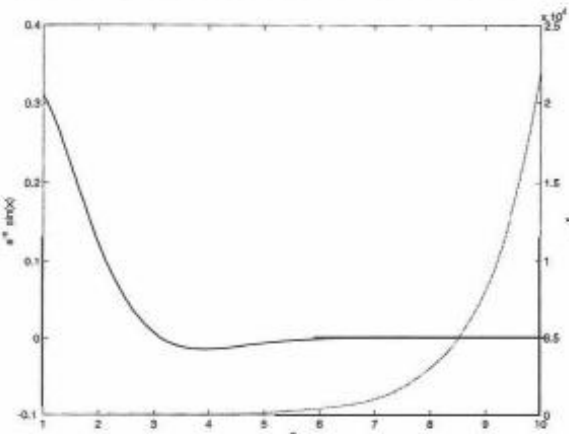


# Specialized 2D plot

|          |  |  |
|----------|--|--|
| bar      | $r^2 = 2 \sin 5t, \quad 0 \leq t \leq 2\pi$ $y = r \sin t$ <pre>t = linspace(0,2*pi,200);<br/>r = sqrt(abs(2*sin(5*t)));<br/>y = r.*sin(t);<br/>bar(t,y)<br/>axis([0 pi 0 inf]);</pre>                       |  |
| errorbar | $f_{\text{approx}} = x - \frac{x^3}{3!}, \quad 0 \leq x \leq 2$ $\text{error} = f_{\text{approx}} - \sin x$ <pre>x = 0:.1:2;<br/>aprx2 = x - x.^3/6;<br/>er = aprx2 - sin(x);<br/>errorbar(x,aprx2,er)</pre> |  |



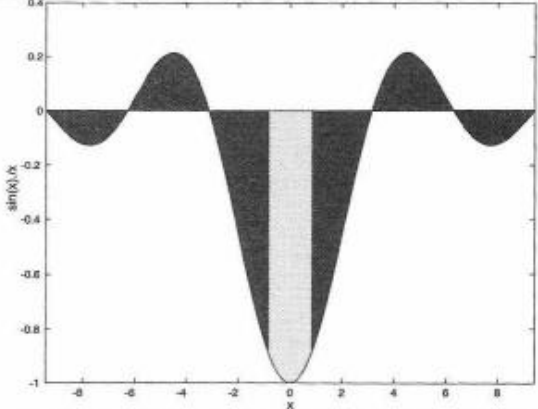
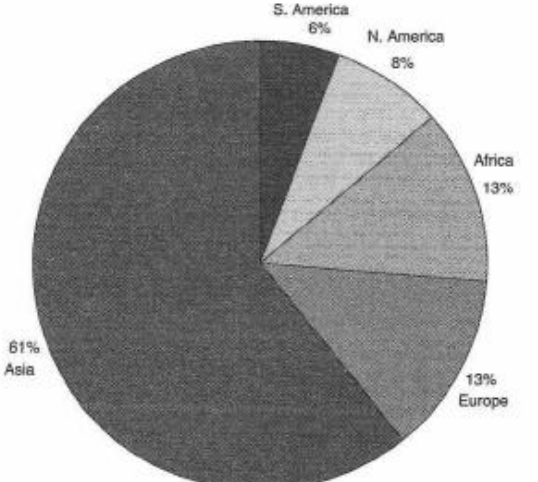
# Specialized 2D plot

| barh       | <pre>World population by continents.  cont = char('Asia','Europe','Africa',...             'N. America','S. America'); pop = [3332;696;694;437;307]; barh(pop) for i=1:5,     gtext(cont(i,:)); end xlabel('Population in millions') Title('World Population (1992)',       'fontsize',18)</pre>               |  <table><caption>World Population (1992)</caption><thead><tr><th>Continent</th><th>Population (millions)</th></tr></thead><tbody><tr><td>Asia</td><td>3332</td></tr><tr><td>Europe</td><td>696</td></tr><tr><td>Africa</td><td>694</td></tr><tr><td>N. America</td><td>437</td></tr><tr><td>S. America</td><td>307</td></tr></tbody></table> | Continent | Population (millions) | Asia | 3332 | Europe | 696 | Africa | 694 | N. America | 437 | S. America | 307 |
|------------|--|---|-----------|-----------------------|------|------|--------|-----|--------|-----|------------|-----|------------|-----|
| Continent  | Population (millions)  |   |           |                       |      |      |        |     |        |     |            |     |            |     |
| Asia       | 3332   |   |           |                       |      |      |        |     |        |     |            |     |            |     |
| Europe     | 696  |   |           |                       |      |      |        |     |        |     |            |     |            |     |
| Africa     | 694  |   |           |                       |      |      |        |     |        |     |            |     |            |     |
| N. America | 437  |   |           |                       |      |      |        |     |        |     |            |     |            |     |
| S. America | 307  |   |           |                       |      |      |        |     |        |     |            |     |            |     |
| plotyy     | <pre><math display="block">y_1 = e^{-x} \sin x, 0 \leq t \leq 10</math> <math display="block">y_2 = e^x</math>  x = 1:.1:10; y1 = exp(-x).*sin(x); y2 = exp(x); Ax = plotyy(x,y1,x,y2); hy1 = get(Ax(1),'ylabel'); hy2 = get(Ax(2),'ylabel'); set(hy1,'string','e^-x sin(x)'); set(hy2,'string','e^x ');</pre> |   |           |                       |      |      |        |     |        |     |            |     |            |     |





# Specialized 2D plot

| area       | $y = \frac{\sin(x)}{x}, \quad -3\pi \leq x \leq 3\pi$ <pre> x = linspace(-3*pi,3*pi,100); y = -sin(x)./x; area(x,y) xlabel('x'), ylabel('sin(x)./x') hold on x1 = x(46:55); y1 = y(46:55); area(x1,y1,'facecolor','y') </pre>   |   |           |                       |            |      |      |     |        |     |     |        |     |     |            |     |    |            |     |    |
|------------|---|--|-----------|-----------------------|------------|------|------|-----|--------|-----|-----|--------|-----|-----|------------|-----|----|------------|-----|----|
| pie        | <p>World population by continents.</p> <pre> cont = char('Asia','Europe','Africa',...             'N. America','S. America'); pop = [3332;696;694;437;307]; pie(pop) for i=1:5,     gtext(cont(i,:)); end Title('World Population (1992)',...       'fontsize',18) </pre> | <p>World Population (1992)</p>  <table border="1"> <thead> <tr> <th>Continent</th> <th>Population (millions)</th> <th>Percentage</th> </tr> </thead> <tbody> <tr> <td>Asia</td> <td>3332</td> <td>61%</td> </tr> <tr> <td>Europe</td> <td>696</td> <td>13%</td> </tr> <tr> <td>Africa</td> <td>694</td> <td>13%</td> </tr> <tr> <td>N. America</td> <td>437</td> <td>8%</td> </tr> <tr> <td>S. America</td> <td>307</td> <td>6%</td> </tr> </tbody> </table> | Continent | Population (millions) | Percentage | Asia | 3332 | 61% | Europe | 696 | 13% | Africa | 694 | 13% | N. America | 437 | 8% | S. America | 307 | 6% |
| Continent  | Population (millions)   | Percentage   |           |                       |            |      |      |     |        |     |     |        |     |     |            |     |    |            |     |    |
| Asia       | 3332  | 61%  |           |                       |            |      |      |     |        |     |     |        |     |     |            |     |    |            |     |    |
| Europe     | 696   | 13%  |           |                       |            |      |      |     |        |     |     |        |     |     |            |     |    |            |     |    |
| Africa     | 694   | 13%  |           |                       |            |      |      |     |        |     |     |        |     |     |            |     |    |            |     |    |
| N. America | 437   | 8%   |           |                       |            |      |      |     |        |     |     |        |     |     |            |     |    |            |     |    |
| S. America | 307   | 6%   |           |                       |            |      |      |     |        |     |     |        |     |     |            |     |    |            |     |    |





## Using subplot to multiple plot

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If you want to make a few plots and place the plots side by side (not overlay), use the `subplot` command to design your layout. The subplot command requires three integer arguments:

```
subplot(m,n,p)
```