Laboratory work 3. Plotting graphs.

The options correspond to a given table of option distributions

The first option:

InstructionTo format the labels explaining the axes and graphs, the default properties of the command window—the root object with a null handle—are inherited. These can be changed within the current session by entering the following commands in the Command Window's command line or in a script:

```
set(0,'DefaultAxesFontSize',12,'DefaultAxesFontName','Arial');
set(0,'DefaultTextFontSize',12,'DefaultTextFontName','Arial');
```

Then they are inherited by the axes and persist throughout the session! Object properties can be changed as needed during programming, as well as interactively.

1. Plot the graph of the function y = with a green dashed line. Add a title and legend.$e^{-x}\sin(10x)$

   a) Create your own descriptor (identifier) for the legend

   b) Explore all the possibilities for placing the legend according to the descriptor you created:

   `set(UsersDescriptorOfLegend,'location')`

   see the result in the command window

2. Plot the graphs of the functions in the same axes $y_1 = e^{-x}\sin(10x)$and $y_2 = \sin(10x)$

   a) Add a legend for both graphs, providing it with a descriptor.

   b) Move the legend by dragging it with the mouse to another place in the window`figure`.

   c) Set the location of the legend outside the graph, at your discretion, for example, in the upper right corner of the graphics window.

3. Plot the graphs of the functions in the same axes: $y_1 = \sin(x)$ and $y_2 = \cos(x)$ on the segment $[-\pi,\pi]$

   a) Provide the graphs with a legend; subscripts in the legend are written with underscores: for example, y_1 = $\sin(x)$…)

   b) Add a grid.

4. Plot the graphs of the functions $y_1 = e^{-x}\sin(x)$ and $y_2 = e^{x}\cos(x)$ on the segment $[-\pi,\pi]$ in the same figure, but different graphic axes (*subplot* function). Choose the step for x so that the last value of the functions is calculated at the point $x=\pi$

   a) Add a general (sgtitle) title: Graphs $y_1 = e^{-x}\sin(x)$ and $y_2 = e^{x}\cos(x)$.

   b) Add a title for each axis.

   b) Study help *sgtitle*; get acquainted (*acquaint[ə ˈkweɪnt] ознакомьтесь*) with the fields of the corresponding structures.

5. Plot the graphs of the functions $y_1=\cos(x)$, $y_2=\sin(x)$, $y_3=\sqrt{x}$, $y_4=x^2$, defined on the interval $(0, \pi)$, each in its own axes with two windows in a row and two – in a column, placed in one figure.

   a) Add a legend for each graph.

   *Comment:*An exponent, which is an algebraic expression with more than one operand, must be enclosed in curly braces, as required by LaTex syntax. For example,`legend('y=x^{1/sin(x)}')`, whereas for simple expressions`legend('y=x^2')` – without brackets.

   b) Use different line styles.

6. Plot the graph of the function y = sin(x), $x \in [0.2\pi]$, $y \in [-2,2]$.

a) Use the plotting command syntax that allows for specifying the domain and modifying the function.

b) Specify the name of the axes.

c) Add the caption '←max(sin(x))' at the extreme point.

7. For the function y(n)=n!, plot a graph on a logarithmic scale along the y-axis.

Comment: It is recommended to use vector operations to implement the task; it is not recommended to use the system function factorial(n)

8. Plot the graphs of the functions f = log(0.5x), g = sin(log(x)), $x \in [0.200\pi]$. In two axes of one figure,

a) on a logarithmic scale along the x-axis;

b) without scaling;

c) the schedules should be designed properly.

9. Plot the graph of the function y = exp(x), $x \in [-2\ \pi, 2\pi]$ in two axes:

a) Use scaling that neutralizes function growth.

b) Without scaling.

c) Design the graphs so that they are informative.

10. Plot the graph of the curve $r=\cos(2\varphi), \varphi \in [0,2\pi]$ in polar coordinate system.

11. Plot the graph of the function y = x sin(1/x), $x \in [-2\pi, 2\pi]$. Use fplot and handle function.

a) In the title, indicate the graphical functionality that is used

b) Add a legend and grid.

The second option:

InstructionTo format the labels explaining the axes and graphs, the default properties of the command window—the root object with a null handle—are inherited. These can be changed within the current session by entering the following commands in the Command Window's command line or in a script:

```
set(0,'DefaultAxesFontSize',12,'DefaultAxesFontName','Arial');
set(0,'DefaultTextFontSize',12,'DefaultTextFontName','Arial');
```

Then they are inherited by the axes and persist throughout the session! Object properties can be changed as needed during programming, as well as interactively.

1. Plot the graph of the function $y = e^{-\sin(10x)}$ using a blue dashed line. Add a title and legend.
   a) Create your own descriptor (identifier) for the legend
   b) Explore all the possibilities for placing the legend according to the descriptor you created and place it in a non-standard way:
   `set(UsersDescriptorOfLegend,'location')`
   see the result in the command window
2. Plot the graphs of the functions in the same axes $y_1 = \cos(\sin(x))$ и $y_2 = \cos(x)$ on the segment
   a) Add a legend for both graphs, providing it with a descriptor.
   b) Move the legend by dragging it with the mouse to another place in the window`figure`.

3. Plot the graphs of the functions in the same axes: : $y_1 = \cos(\sin(x))$ и $y_2 = \cos(x)$on the segment [-π, π]
   a) Provide the graphs with a legend; subscripts in the legend are written as underscores: for example, y_1.
   b) Add a grid.

4. Plot the graphs of the functions $y_1 = e^{\cos(x)}\sin(x)$ и $y_2 = e^{\sin(x)}\cos(x)$ ton he segment [-π,π] in the same figure, but different graphic axes (*subplot* function). Choose the step for x so that the last value of the functions is calculated at the point x=π
   a) Add a general (sgtitle) title that contains the graph functions
   b) Add a title for each axis.
   b) Study help sgtitle; get acquainted with the fields of the corresponding structures.

5. Plot the graphs of the functions y_1=1/(.1+x), y_2=cos(x), $y_3=\sqrt{x}$, y_4=x2, defined on the segment [0, π], each in its own axes, the axes are located in one column and placed in one figure.
   a) Add a legend for each graph.

   *Comment:*An exponent, which is an algebraic expression with more than one operand, must be enclosed in curly braces, as required by LaTex syntax. For example,`legend('y=x^{1/sin(x)}')`, whereas for simple expressions`legend('y=x^2')` – without brackets.
   b) Use different line styles.

6. Plot the graph of the function y = x sin(x), x∈[0.2π], y∈[-2π, 2π].
   a) Use the plotting command syntax that allows for specifying the domain and modifying the function.
   b) Specify the name of the axes.
   c) Add the caption '←max(function expression)' at the extreme point.

7. For the function y(n)=n!, plot a graph on a logarithmic scale along the y-axis.

Comment:It is recommended to use vector operations to implement the task; it is not recommended to use the system function factorial(n)

8. Plot the graphs of the functions f = log(0.1x), g = cos(log(x)), $x \in [0.200\pi]$ in two axes of one figure,

a) on a logarithmic scale along the x-axis;
b) without scaling;
c) the schedules should be designed properly.

9. Plot the graph of the function y = exp(x), $x \in [-2\ \pi, 2\pi]$ in two axes:

a) Use scaling that neutralizes function growth.
b) Without scaling.
c) Design the graphs so that they are informative.

10. Plot the graph of the curve $r=\sin(2\varphi), \varphi \in [-2\ \pi, 2\pi]$ in polar coordinate system.

11. Plot the graph of the function $y = (x)^{-1} \sin(x)$, $x \in [-2\pi, 2\pi]$. Use fplot and function_handle.

a) In the title, indicate the graphical functionality that is used
b) Add a legend and grid.

The third option:

Instruction To format the labels explaining the axes and graphs, the default properties of the command window—the root object with a null handle—are inherited. These can be changed within the current session by entering the following commands in the Command Window's command line or in a script:

```
set(0,'DefaultAxesFontSize',12,'DefaultAxesFontName','Arial');
set(0,'DefaultTextFontSize',12,'DefaultTextFontName','Arial');
```

Then they are inherited by the axes and persist throughout the session! Object properties can be changed as needed during programming, as well as interactively.

1. Plot the graph of the function $y = e^{-x}\sin(1/x)$, x∈[-1,1] with a green dotted line. Add a title and legend.

   a) Create your own descriptor (identifier) for the legend

   b) Explore all the possibilities for placing the legend according to the descriptor you created:

   `set(UsersDescriptorOfLegend,'location')`

   see the result in the command window

2. Plot the graphs of the functions in the same axes $y_1 = e^{-x}\sin(10x)$ и $y_2 = \sin(x)$

   a) Add a legend for both graphs, providing it with a descriptor.

   b) Move the legend by dragging it with the mouse to another place in the window`figure`.

   c) Set the location of the legend outside the graph, at your discretion, for example, in the upper right corner of the graphics window.

3. Plot the graphs of the functions in the same axes: $y_1 = (\sin(x))^2$ и $y_2 = \cos(x)$on the segment [-π,π]

   a) Provide the graphs with a legend; subscripts in the legend are written as underscores: for example, y_1.

   b) Add a grid.

4. Plot the graphs of the functions $y_1 = e^{1/x}\sin(x)$ и $y_2 = e^{x}\cos(x)$ on the interval [eps, π] in the same figure, but different graphic axes (subplot function). Choose the step for x so that the last value of the functions is calculated at the point x=π

   a) Add a general (sgtitle) title that contains the graph functions

   b) Add titles for each axis.

   Study help sgtitle; get acquainted with the fields of the corresponding structures.

5. Plot the graphs of the functions $y_1=\cos^2(x)$, $y_2=1-\sin(x)$, $y_3=\sqrt{x}$, $y_4=x^2$, defined on the interval [0, π], each in its own axes, which are located in one row of windows.

   a) Add a legend for each graph.

   *Comment:*An exponent, which is an algebraic expression with more than one operand, must be enclosed in curly braces, as required by LaTex syntax. For example,`legend('y=x^{1/sin(x)}')`, whereas for simple expressions`legend('y=x^2')` – without brackets.

   b) Use different line styles.

6. Plot the graph of the function y = sin(x)/x, x∈[0.2π], ay∈[-1.5,1.5].

   a) Use the plotting command syntax that allows for specifying the domain and modifying the function.

   b) Specify the name of the axes.

c) Add the caption '←max(graph function)' at the extreme point.

7. For the function y(n)=n!, plot a graph on a logarithmic scale along the y-axis.
Comment:It is recommended to use vector operations to implement the task; it is not recommended to use the system function factorial(n)

8. Plot the graphs of the functions $f = log(0.1x)$, $g = sin(log(x))$, $x \in [0,200\pi]$. In two axes of one figure,
a) on a logarithmic scale along the *x*-axis;
b) without scaling;
c) the schedules should be designed properly.

9. Plot the graph of the function $y = \exp(tg(x))$, $x \in [-\pi, \pi]$ in two axes:
a) Use scaling that neutralizes function growth.
b) Without scaling.
c) Design the graphs so that they are informative.

10. Plot the graph of the curve $r=\cos(2\varphi)$, $\varphi \in [0,2\pi]$ in polar coordinate system.

11. Plot the graph of the function $y = 1/x \sin(x)$, $x \in [-2\pi,2\pi]$. Use fplot and function_handle.
a) In the title, indicate the graphical functionality that is used
b) Add a legend and grid.

The fourth option: **Instruction** To format the labels explaining the axes and graphs, the default properties of the command window—the root object with a null handle—are inherited. These can be changed within the current session by entering the following commands in the Command Window's command line or in a script:

```
set(0,'DefaultAxesFontSize',12,'DefaultAxesFontName','Arial');
set(0,'DefaultTextFontSize',12,'DefaultTextFontName','Arial');
```

Then they are inherited by the axes and persist throughout the session! Object properties can be changed as needed during programming, as well as interactively.

1. Plot the graph of the function $y = e^{-x}\sin(10x)$ with a green dashed line. Add a title and legend.

   a) Create your own descriptor (identifier) for the legend

   b) Explore all the possibilities for placing the legend according to the descriptor you created:

   `set(UsersDescriptorOfLegend,'location')`

   see the result in the command window

2. Plot the graphs of the functions in the same axes $y_1 = e^{-x}\sin(10x)$ и $y_2 = \sin(10x)$

   a) Add a legend for both graphs, providing it with a descriptor.

   b) Move the legend by dragging it with the mouse to another place in the window`figure`.

   c) Set the location of the legend outside the graph, at your discretion, for example, in the upper right corner of the graphics window.

3. Plot the graphs of the functions in the same axes: $y_1 = \sin(x)$ и $y_2 = \cos(x)$ on the segment $[-\pi,\pi]$

   a) Provide the graphs with a legend; subscripts in the legend are written with underscores: for example, y_1 = …)$\sin(x)$

   b) Add a grid.

4. Plot the graphs of the functions $y_1 = e^{-x}\sin(x)$ и $y_2 = e^{x}\cos(x)$on the segment $[-\pi,\pi]$ in the same figure, but different graphic axes (subplot function). Choose the step for x so that the last value of the functions is calculated at the point $x=\pi$

   a) Add a general (sgtitle) title that contains the graph functions

   b) Add a title for each axis.

   Study help sgtitle; get acquainted with the fields of the corresponding structures.

5. Plot the graphs of the functions $y_1=\cos(x)$, $y_2=\sin(x)$, $y_3=\sqrt{x}$, $y_4=x^2$, defined on the interval $[0, \pi]$, each in its own axes with two windows in a row and two in a column, placed in one figure.

   a) Add a legend for each graph.

   *Comment:*An exponent, which is an algebraic expression with more than one operand, must be enclosed in curly braces, as required by LaTex syntax. For example,`legend('y=x^{1/sin(x)}')`, whereas for simple expressions`legend('y=x^2')` – without brackets.

   b) Use different line styles.

6. Plot the graph of the function $y = \sin(x)$, $x\in[0.2\pi]$, $ay\in[-2,2]$.

   a) Use the plotting command syntax that allows for specifying the domain and modifying the function.

   b) Specify the name of the axes.

c) Add the caption '←max(function expression)' at the extreme point.

7. For the function y(n)=n!, plot a graph on a logarithmic scale along the y-axis.
Comment: It is recommended to use vector operations to implement the task; it is not recommended to use the system function factorial(n)

8. Plot the graphs of the functions $f = log(x)$, $g = sin(log(x))$, $x \in [0.200\pi]$. In two axes of one figure,
a) on a logarithmic scale along the x-axis;
b) without scaling;
c) the schedules should be designed properly.

9. Plot the graph of the function $y = exp(x)$, $x \in [-\pi,\pi]$ in two axes:
a) Use scaling that neutralizes function growth.
b) Without scaling.
c) Design the graphs so that they are informative.

10. Plot the graph of the curve $r=cos(4\varphi)$, $\varphi \in [0,2\pi]$ in polar coordinate system.

11. Plot the graph of the function $y = (x \sin(1/x))^2$, $x \in [-3\pi,3\pi]$. Use fplot and function_handle.
a) In the title, indicate the graphical functionality that is used
b) Add a legend and grid.

The fifth option:

InstructionTo format the labels explaining the axes and graphs, the default properties of the command window—the root object with a null handle—are inherited. These can be changed within the current session by entering the following commands in the Command Window's command line or in a script:

```
set(0,'DefaultAxesFontSize',12,'DefaultAxesFontName','Arial');
set(0,'DefaultTextFontSize',12,'DefaultTextFontName','Arial');
```

Then they are inherited by the axes and persist throughout the session! Object properties can be changed as needed during programming, as well as interactively.

1. Plot the graph of the function $y = e^{-x}\sin(10x)$ with a green dashed line. Add a title and legend.$e^{-x}\sin(10x)$

   a) Create your own descriptor (identifier) for the legend

   b) Explore all the possibilities for placing the legend according to the descriptor you created:

   `set(UsersDescriptorOfLegend,'location')`

   see the result in the command window

2. Plot the graphs of the functions in the same axes $y_1 = e^{-x}\sin(x)$ и $y_2 = \sin(x)$

   a) Add a legend for both graphs, providing it with a descriptor.

   b) Move the legend by dragging it with the mouse to another place in the window`figure`.

   c) Set the location of the legend outside the graph, at your discretion, for example, in the upper right corner of the graphics window.

3. Plot the graphs of the functions in the same axes: y1 = and y2 = on the segment [-$\sin^2(x)\cos(x)\pi,\pi$]

   a) Provide the graphs with a legend; subscripts in the legend are written as underscores: for example, y_1.

   b) Add a grid.

4. Plot the graphs of the functions $y_1 = e^{-x}\sin(x)$ и $y_2 = e^{\sin(x)}\cos(x)$ on the segment [-π, π] in the same figure, but different graphic axes (subplot function). Choose the step for x so that the last value of the functions is calculated at the point x=π

   a) Add a general (sgtitle) title that contains the graph functions

   b) Add a title for each axis.

   Study help sgtitle; get acquainted with the fields of the corresponding structures.

5. Plot the graphs of the functions y_1=cos(x), y_2=sin(x), $y_3=\sqrt{x}$, $y_4=x^2$, defined on the interval [0, π], each in its own axes with two windows in a row and two in a column, placed in one *figure*.

   a) Add a legend for each graph.

   *Comment:*An exponent, which is an algebraic expression with more than one operand, must be enclosed in curly braces, as required by LaTex syntax. For example,`legend('y=x^{1/sin(x)}')`, whereas for simple expressions`legend('y=x^2')` – without brackets.

   b) Use different line styles.

6. Plot the graph of the function y = sin(x), x∈[0.2π], ay∈[-2,2].

   a) Use the plotting command syntax that allows for specifying the domain and modifying the function.

b) Specify the name of the axes.
c) Add the caption '←max(function expression)' at the extreme point.

7. For the function y(n)=n!, plot a graph on a logarithmic scale along the y-axis.
Comment:To implement the task, it is recommended to use vector operations; it is not advisable to use the system function factorial(n).

8. Plot the graphs of the functions $f = log(0.1x)$, $g = sin(log(x))$, $x \in [0,200\pi]$. In two axes of one figure,
a) on a logarithmic scale along the x-axis;
b) without scaling;
c) the schedules should be designed properly.

9. Plot the graph of the function $y = sin(x)\ exp(x)$, $x \in [-2\ \pi,2\pi]$ in two axes:
a) Use scaling that neutralizes function growth.
b) Without scaling.
c) Design the graphs so that they are informative.

10. Plot the graph of the curve $r=\cos(2\varphi)$, $\varphi \in [-2\ \pi,2\pi]$ in polar coordinate system.

11. Plot the graph of the function $y = x \sin(1/x)$, $x \in [-2\pi,2\pi]$. Use fplot and function_handle
a) In the title, indicate the graphical functionality that is used
b) Add a legend and grid.