output examples

Table of Contents

formatted display of results in command window

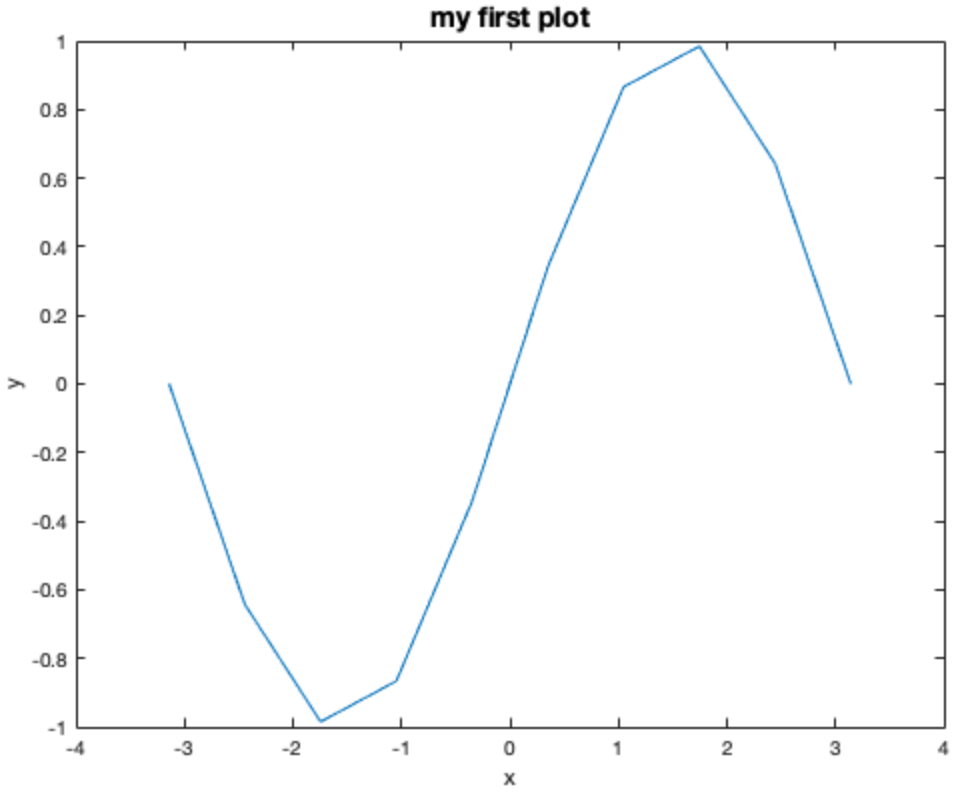
```
clear all
clc

% fprintf is "file printing formatted" (print formatted text to a
 file)
% where a "file" is a device such as the command window (default)
% or a hard disk, tape, etc.

A = 12345.67890;
fprintf('This is my value of A \n') % note \n to start new line
fprintf('    A = %0.3f \n\n', A)

% the % starts a variable output format specification
% the 0 or other value is minimum width of text in which value is
 displayed
% the .3 or other value means round to 3 digits to right of decimal
 point
% the f means floating point (decimal number)

% as usual, enter "help fprintf" for more options
```

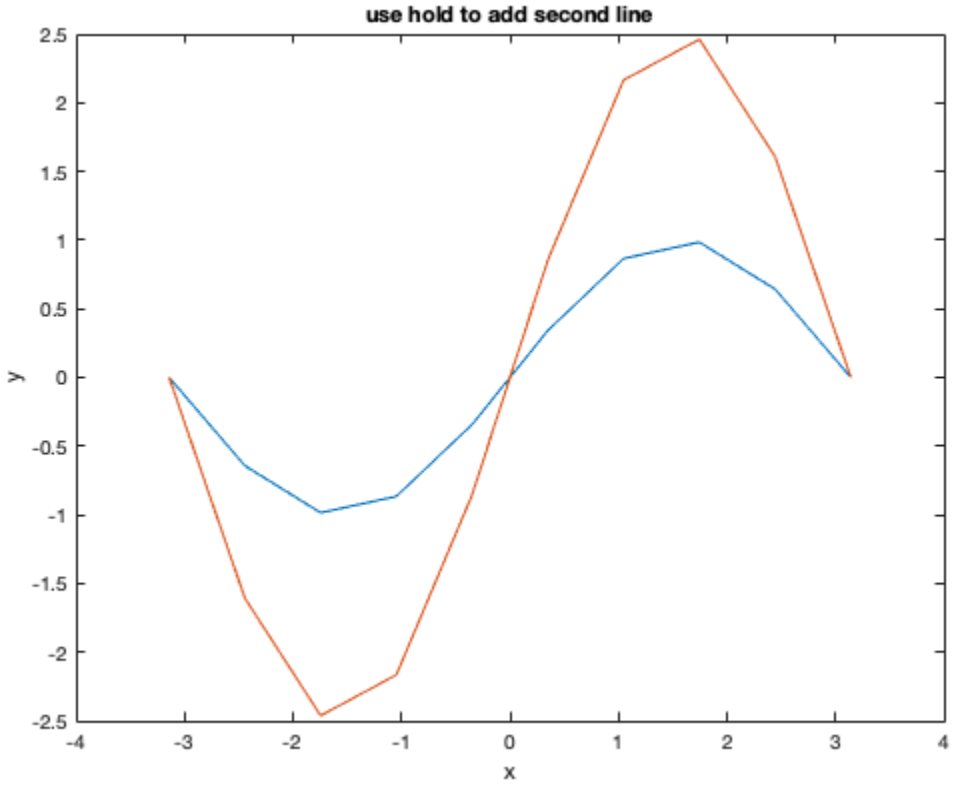
```
This is my value of A
    A = 12345.679
```

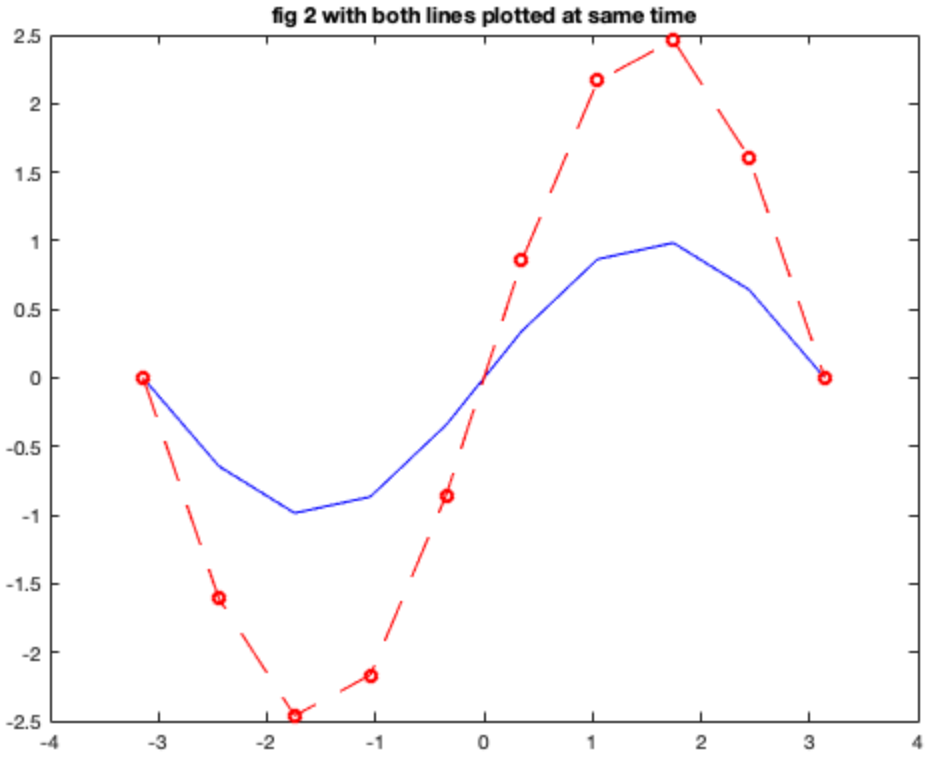
plotting 01 - basic plotting

```
x = linspace(-pi,pi,10);
y = sin(x);

figure(1)
plot(x,y)
title('my first plot','FontSize',14)
```

```
ylabel('y')
xlabel('x')

% compare size of title and axis label text on the plot
% could also change the FontSize of axis labels

% now we create a second y variable
y2 = 2.5*y;

% two ways to add y2 to the plot
% (1) use hold command
figure(2)
plot(x,y)
title('use hold to add second line')
ylabel('y')
xlabel('x')
hold on
plot(x,y2)
hold off

% (2) plot both at once, e.g., in a new figure window
% this also illustrates adding a plot format string,
% which can be done after any x,y pair, here as examples,
% b = blue, r = red, - = solid line, -- = dashed line, o = circles
figure(3)
plot(x,y,'b-',x,y2,'ro--')
title('fig 2 with both lines plotted at same time')
```

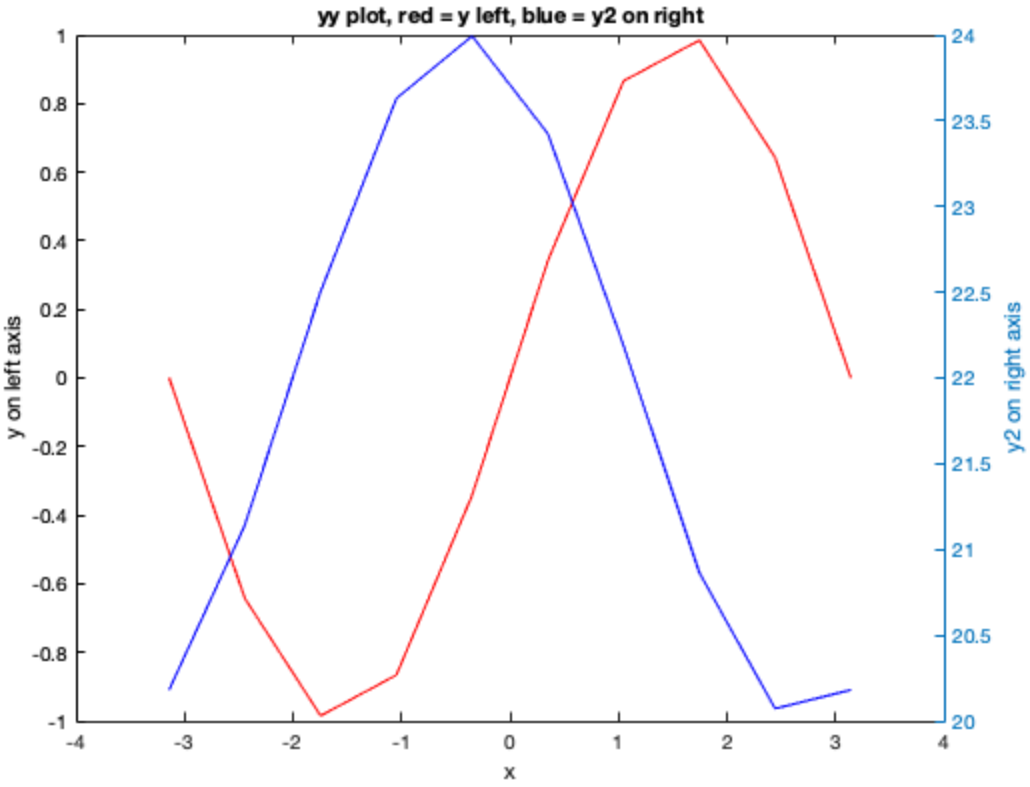

my first plot
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
y
-4
-3
-2
-1
0
1
2
3
4
x


use hold to add second line
2.5
2
1.5
1
0.5
0
-0.5
-1
-1.5
-2
-2.5
y
-4
-3
-2
-1
0
1
2
3
4
x



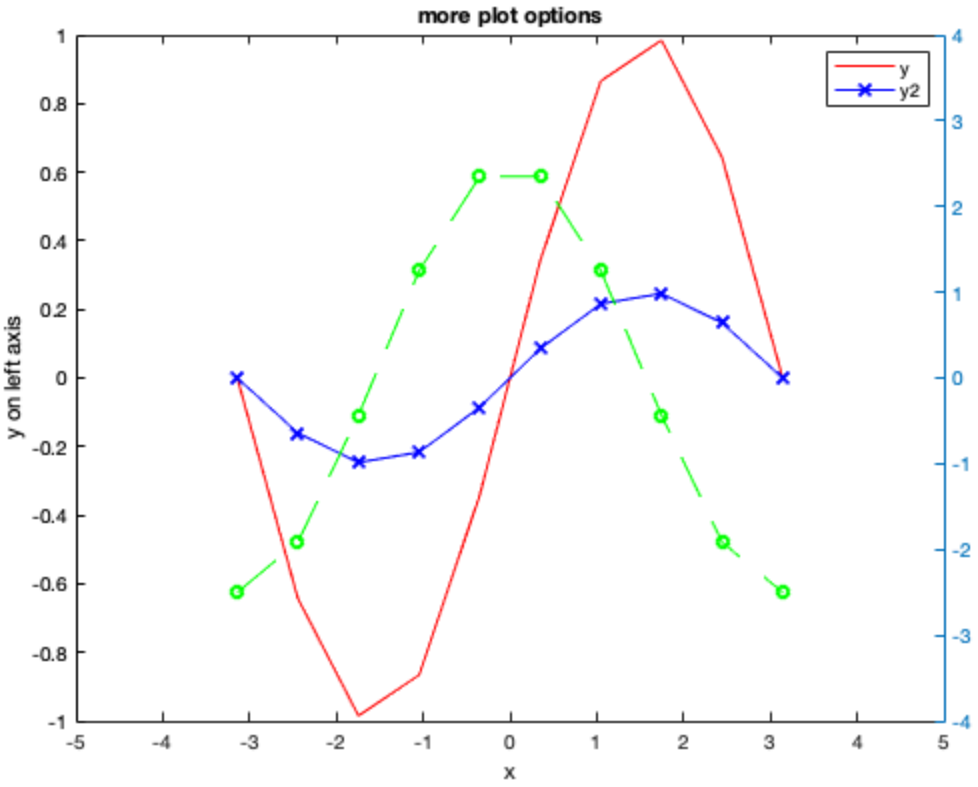
plotting 02 - double y plots

```
% you can plot data of very different scale on the same plot
% using yyaxis to set the active axis

yyaxis left

plot(x,y,'r')
title('yy plot, red = y left, blue = y2 on right')
xlabel('x')
ylabel('y on left axis')

y2 = 22 + 2*sin(x+2);

yyaxis right

plot(x,y2,'b')
ylabel('y2 on right axis')
```



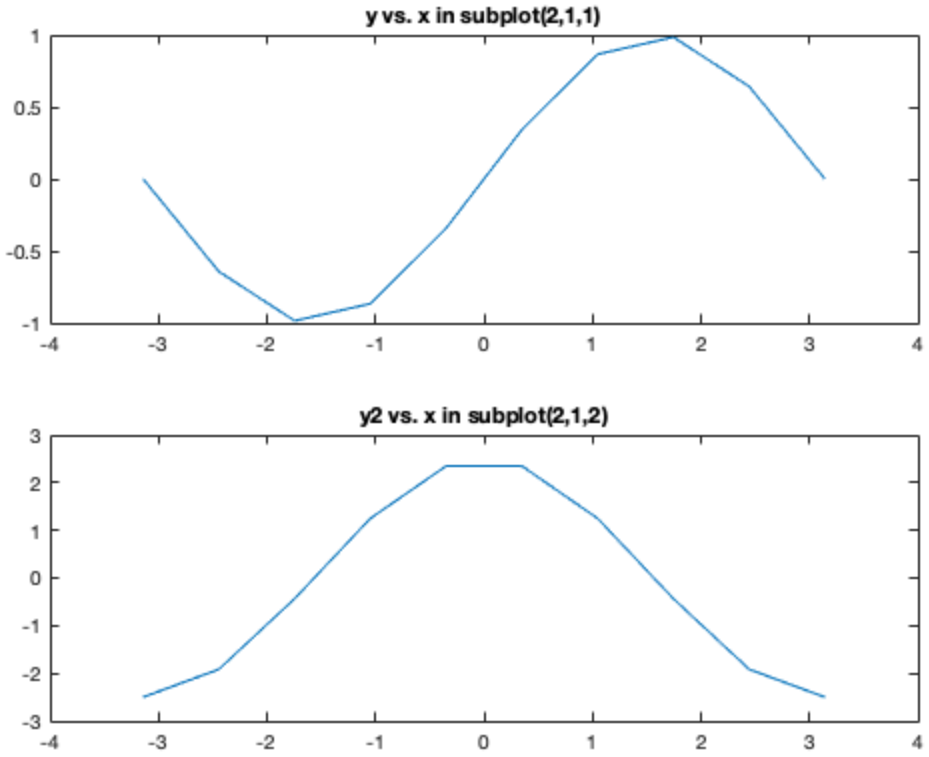
plotting 03 - more plot options

```
y2 = 2.5*cos(x);

% you can optionally specify plot color, symbols and lines
plot(x,y,'bx-',x,y2,'go--')
title('more plot options')

% the axis is set automatically to include all data on the plot
% BUT you can change the axis ranges
axis([-5 5 -4 4])

% you can add a legend, as usual, enter "help legend" for more options
legend('y','y2')
```



plotting 04 - subplots

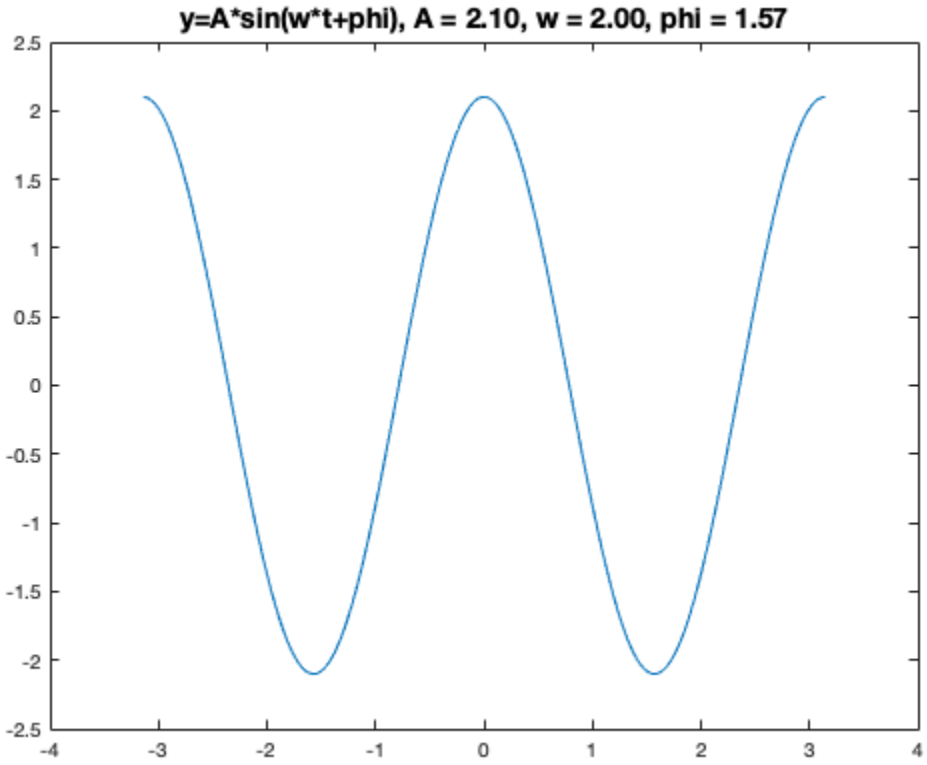
```
% you can put more than one plot into one plot window with subplots

subplot(2,1,1) % subplot with 2 rows, 1 column, put plot in location 1
plot(x,y)
title('y vs. x in subplot(2,1,1)')
subplot(2,1,2)
plot(x,y2)
title('y2 vs. x in subplot(2,1,2)')
```



plotting 05 - put variable values into plot titles

```
% let's say we want to study the effect of A, omega and phi on our
 plot
% and we want to see in the plot title the current values

A = 2.1; % amplitude
w = 2; % frequency
phi = pi/2; % phase shift

t = linspace(-pi,pi,1000);
y = A*sin(w*t + phi);

clf % clear figures - otherwise will appear in subplot from above

plot(t,y)

% assign a string variable using sprintf function
% where sprintf is string print formatted

tt = sprintf('y=A*sin(w*t+phi), A = %0.2f, w = %0.2f, phi =
 %0.2f', ...
    A,w,phi);
```

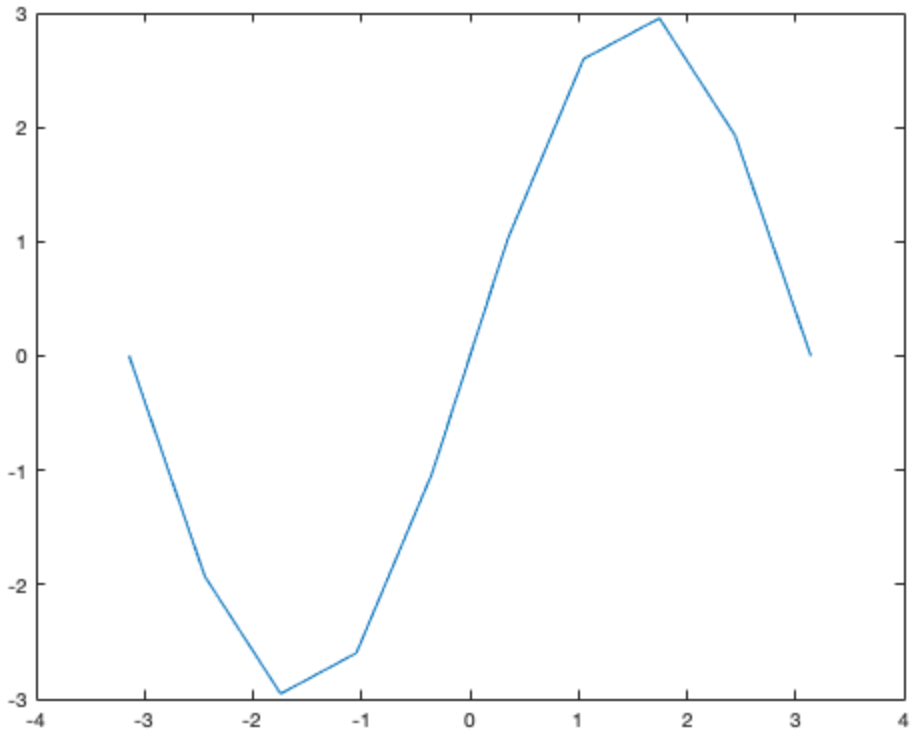
```
% note line split and continued with ... but can't split string
 between ''

title(tt, 'FontSize', 14)
```



user-written function

```
% functions allow you to re-use code simply by "calling" the function
% a function might have 1 to 1000's of lines of code
% without functions, you might have to copy and paste the same code
% many times in a program
% but what if you wanted to make a change?
% you would have to search and replace many instances
% and hope you found everything
% with functions, you simply make the change in one place

% built-in Matlab functions are defined in m-files located
% in function "libraries" in your Matlab distribution
% Matlab calls function libraries "toolboxes"

x = linspace(-pi,pi,10);
a = 2;

% call user-written function in file myfunc.m
y = myfunc(x,a);
```

```
plot(x,y)

% for PUBLISH type function so I can see it in PDF for grading
type myfunc.m


function z = myfunc(t,w)
    % comment as 2nd line starts documentation of function
    % which can be read from command line with, e.g., help myfunc

% first line of a function file is, from left to right
% keyword "function"
% variable value returned to calling script (scalar or matrix)
% = sign
% name of function, which must be name of .m file
% list of inputs (scalar or array)

% note variable names can differ between main script and function
% values in function are "local" in "scope" and
% values are passed by location in argument list, not by name

w = 1.5 * w;
z = w * sin(t);
```



load and save to data files

```
% some data
a = [1 2 3; 4 5 6];

% save to file 'adata.txt' variable a with option -ascii
save adata.txt a -ascii

% where ascii = American Standard Code for Information Interchange
% without this option the file will be in binary format
% and load would put data into a 'structure' which
% we haven't learned about yet
% using .txt filename extension for acsii data
% allows you to double-click on file on desktop to
% open and inspect with text editor, e.g., Windows Notepad

% now check to make sure we can read the data
anew = load('adata.txt')

% optionally, for PUBLISH, we can "type" the file
% but ONLY if saved with the -ascii option
% PUBLISH to PDF fails when file is in binary format
type adata.txt
```

```
anew =

     1     2     3
     4     5     6


   1.0000000e+00   2.0000000e+00   3.0000000e+00
   4.0000000e+00   5.0000000e+00   6.0000000e+00
```

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