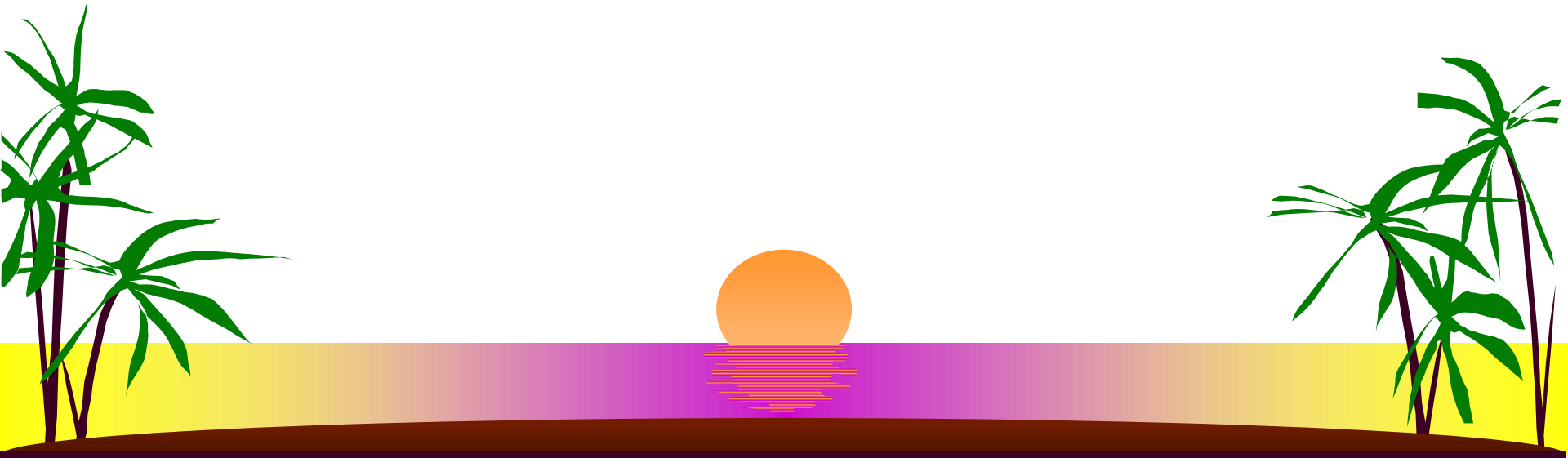
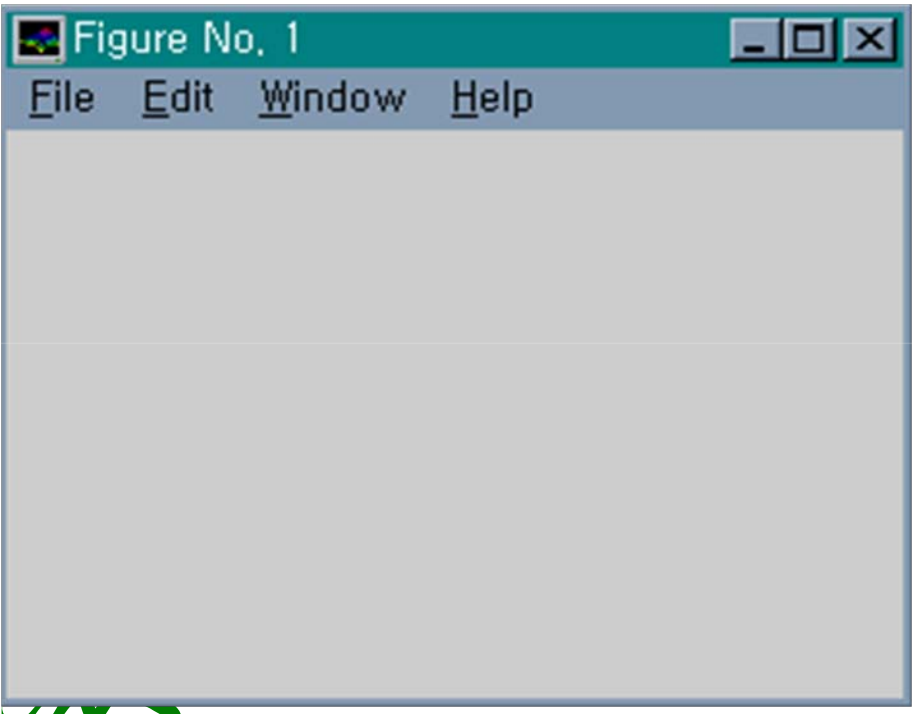
Matlab Graphics

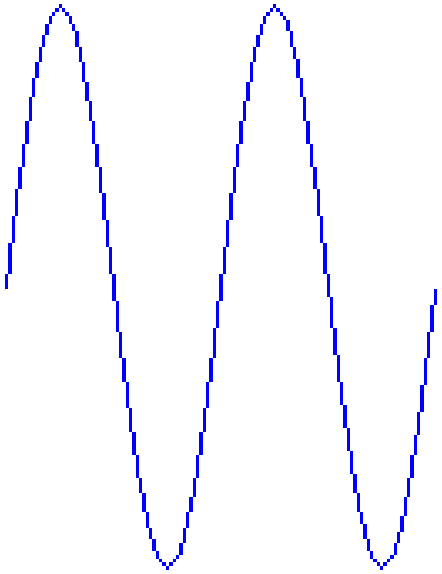


1.Graphics Object



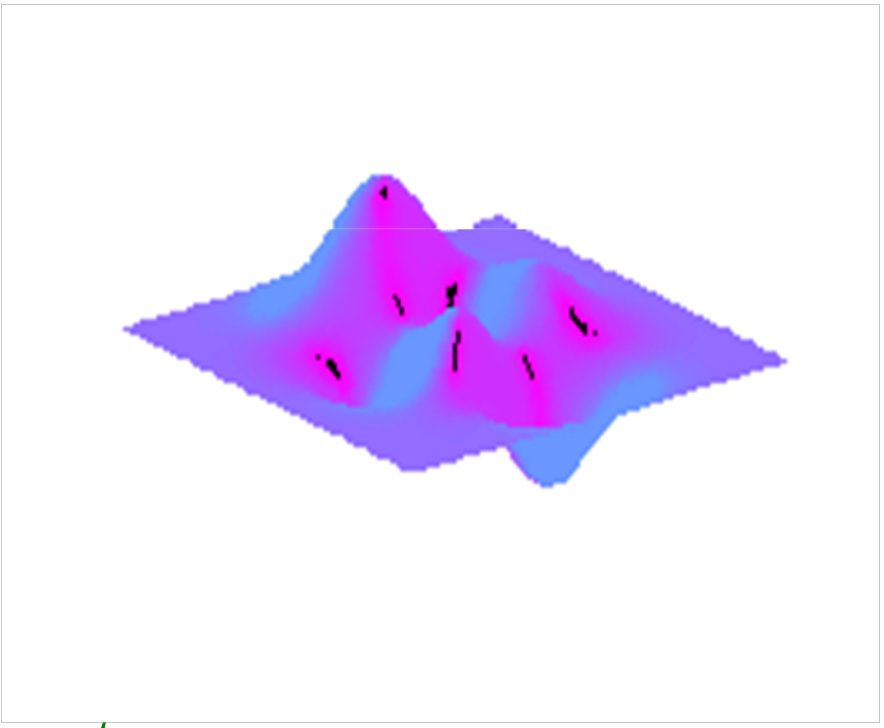
(a) figure object

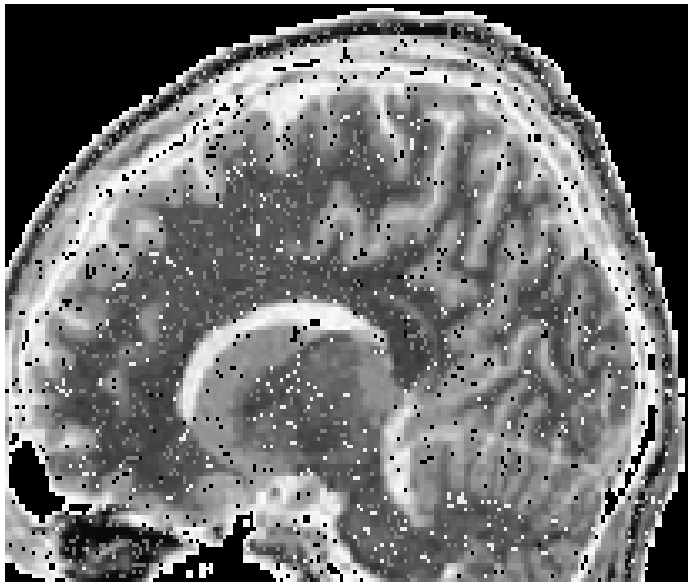
(b) Axes object



(c) Line object

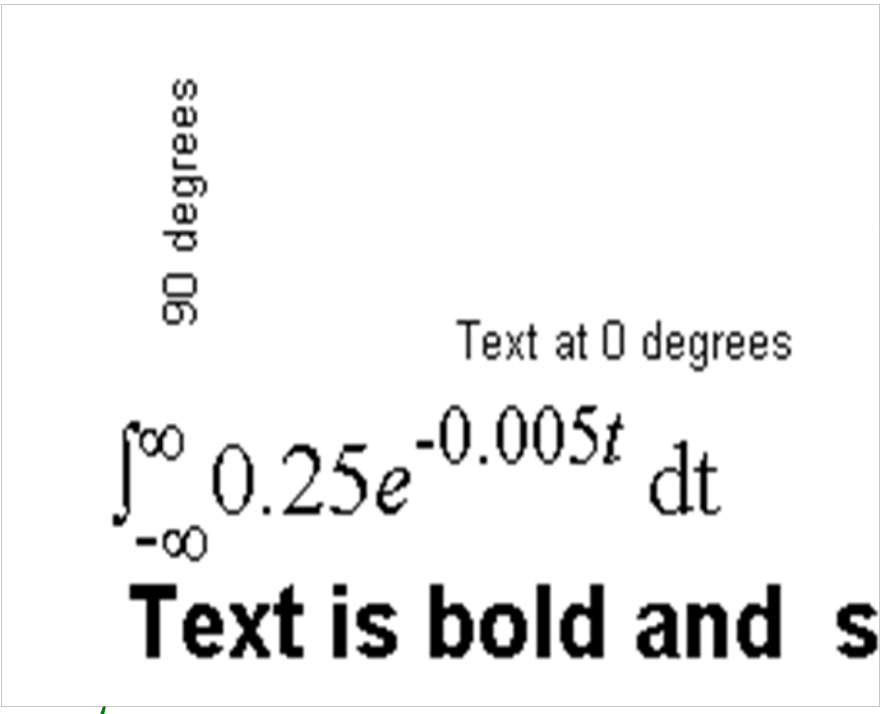
(d) Patch object



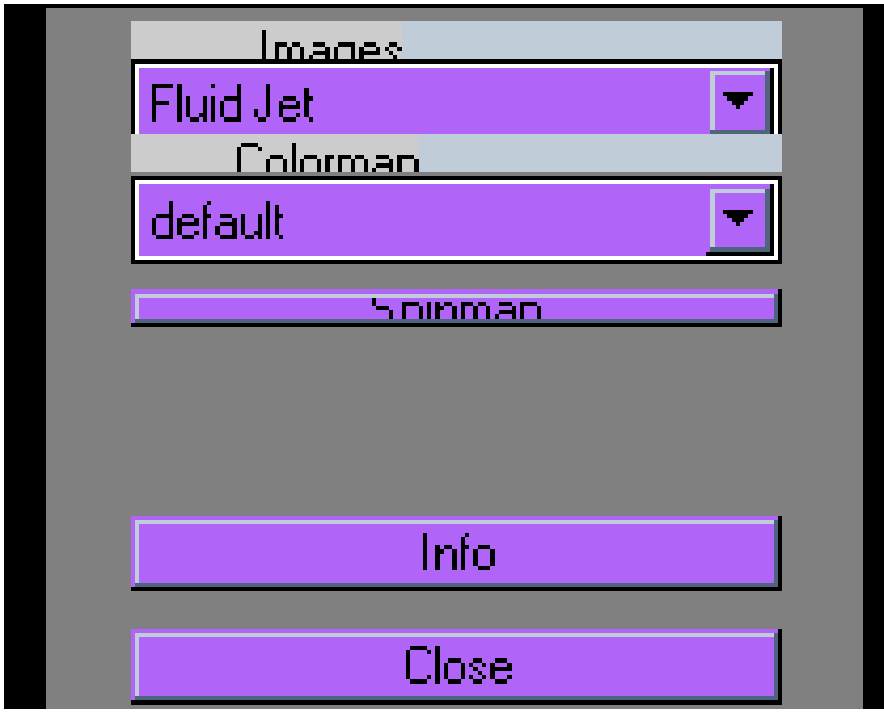


(e) Surface object

(g) Image object

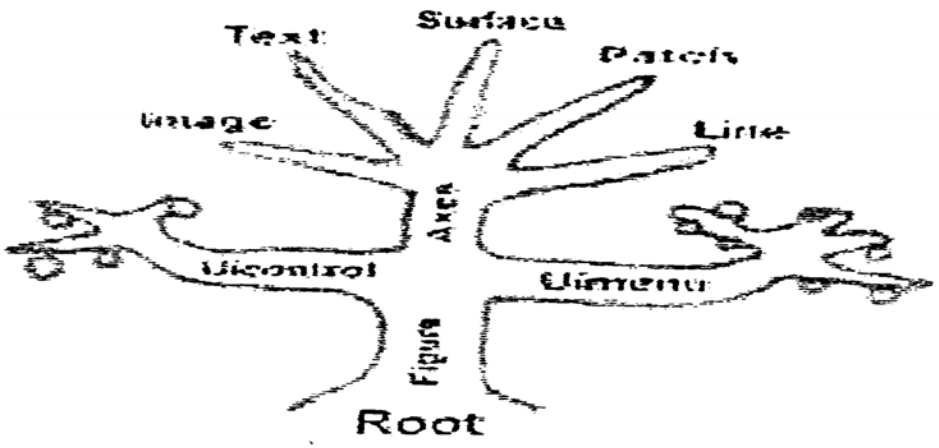


(g) Text



(h) Uicontrol object

2. 계층조직



[그림 3-2] matlab 계층도

1)matlab 그래프들은 객체들의 조합

2)객체들은 계층도에 의해 분류

3)상위객체는 하위 객체들을 제어

4)객체들은 같은 level의 객체들을 소유

3. Handle Graphics

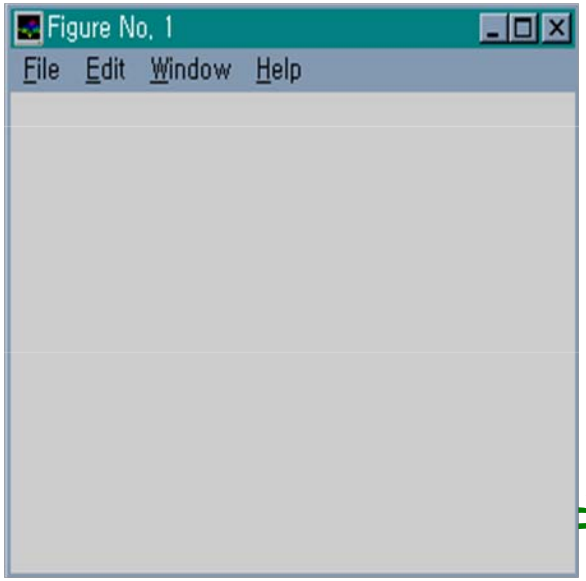
*** handle** 이란?

-각각의 matlab 그래프 함수가 객체들을 제어 할 수 있도록 새로 만들어지는 객체마다 고유한 숫자를 반환하는데 이들 고유한 숫자를 말함.

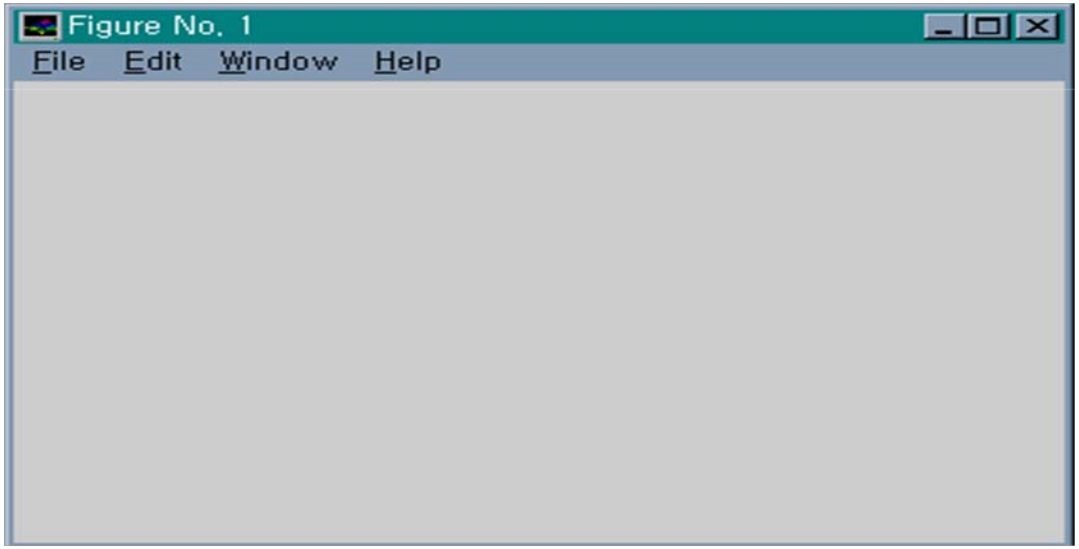
h_fig=figure

■ h_fig=

1



새로 생성된 figure



“numbertitle”이 “Figure No.1”

Figure No.1 - numbertitle

numbertitle - 주어진 figure 의 propertyname

Figure No.1 - 주어진 figure의 propertyvalue

“set.m”함수

- handle을 이용하여 각각의 객체성질(propertyname)을 조정

전형적인 사용법 : set.m

“set(handle, propertyname, propertyvalue)”

➡ 주어진 handle에 해당하는 객체의 propertyname을

➡ 새로운 propertyvalue로 고쳐준다.

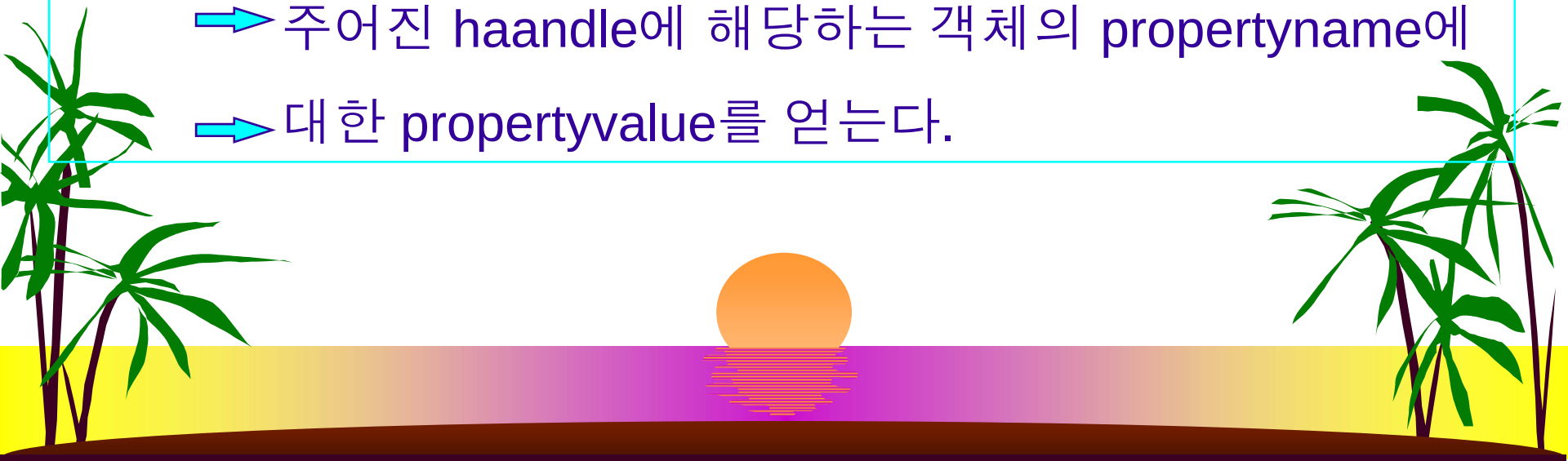
“get.m”함수

-handle을 이용하여 해당 객체의 성질에 할당된 값 (propertyvalue)을 얻게 해줌

전형적인 사용법:get.m

“propertyvalue=get(handle, propertyname)”

➡ 주어진 haandle에 해당하는 객체의 propertyname에 대한 propertyvalue를 얻는다.



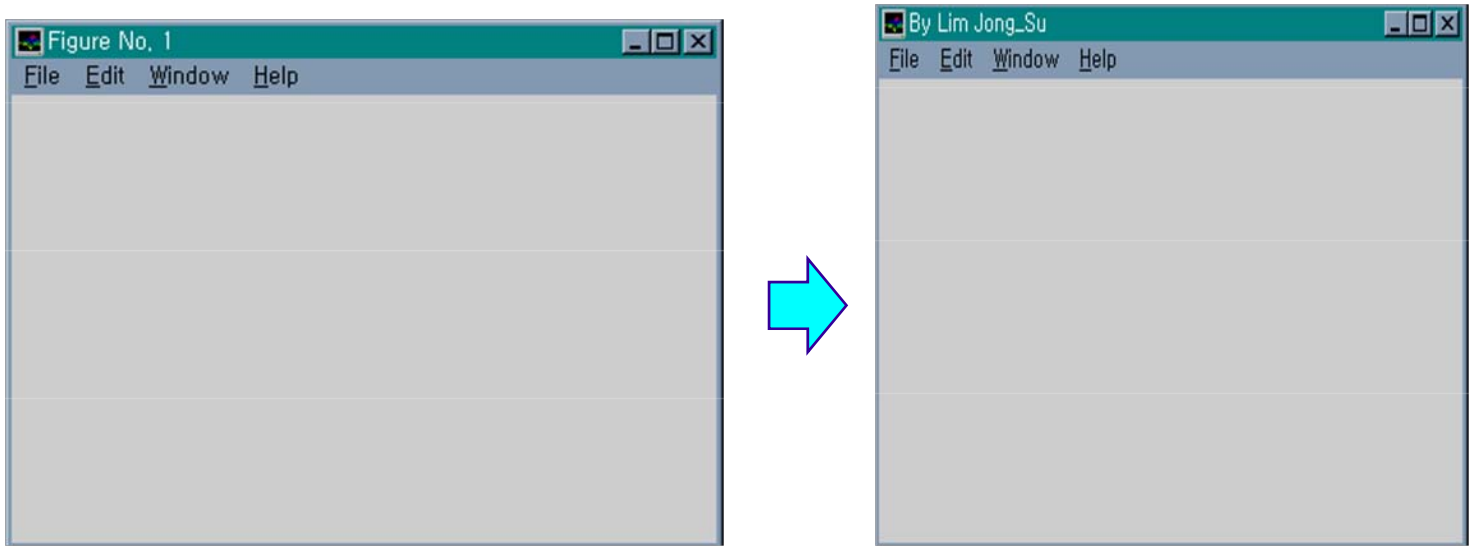
“numbertitle”이 “Figure No.1”

가. propertyname인 numbertitle을 없애기 위해서 propertyvalue 에 “off”를 할당

나. 새로운 이름을 할당하기 위새서 propertyname인 “:name”에 대한 propertyvalue에 “By Blim Jong_Su”를 할당

“set.m”함수의 이용

- set(h_fig1,’numbertitle’,’off ‘,’name’,’By Lim Jong_Su’)



“get.m”함수의 이용

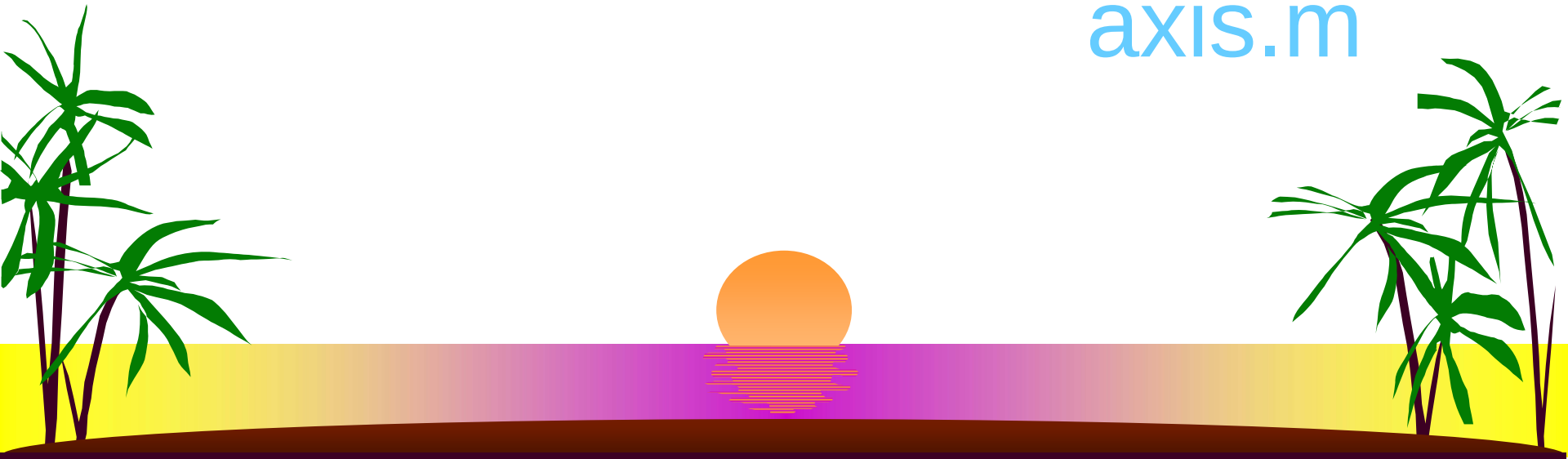
```
h_size=get(h_fig1,’position’)

□
h_size =

    189  304  390  246
```

Matlab graphics

Low_level function : text.m

High_level function : plot.m

axis.m



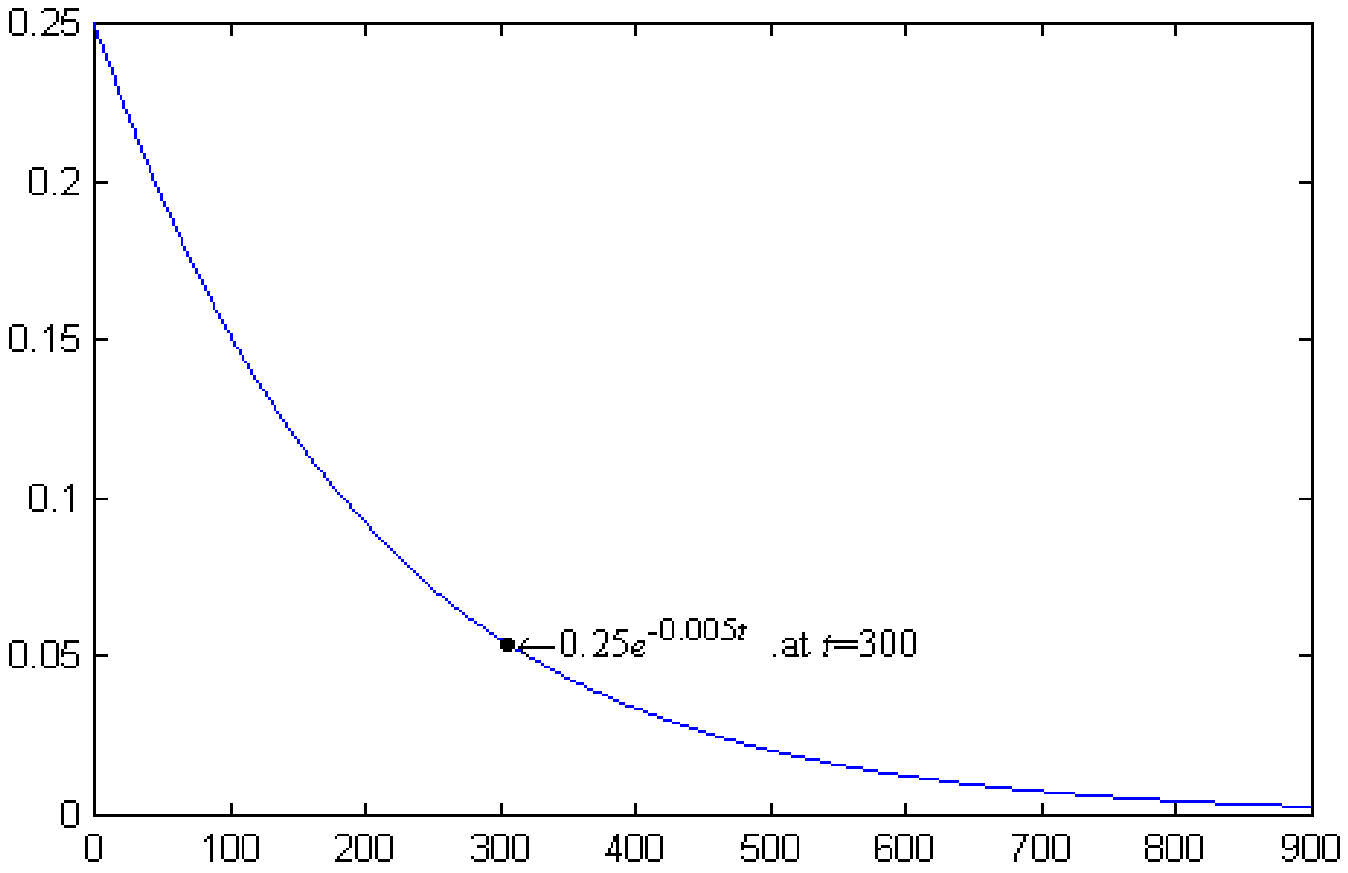
1. text.m

- Syntax
  - text_handle=text(x,y,z,'string')
  - text_handle=text(x,y,z,'propertyname','propertyvalue')
- 특수 symbol을 이용하는 방법
- 특수문자 : Latex문자 체계
  - text object의 interpreter가 “tex"인 경우

2. text.m

- ex3
  - t=0:900;
  - plot(t,.25*exp(-.005*t))
  - h=text(300,.25*exp(-.005*300),...

    '₩bullet₩leftarrow₩fontname{times}0.25{₩ite}^{-0.005{₩itt}} .at {₩itt}=300');



< 특수 symbol 사용법 >

3 text.m

Font 의 종류	*주어진 font 에 대한 설명*
\bf	Bold font
\it	Italics font
\sl	Oblique font
\rm	Normal font
\fontname{fontname}	위에 주어진 font 외의 다른 font

- 특수 문자 지정어들은 '{ }'으로 구분
- 아래 첨자는 ' _ ', 윗 첨자는 ' ^ '
- " ₩ , { , } , _ , ^ "문자들은 앞에 ' ₩ '을 첨가하면 display

4 text.m

- ex1
  - get(h,'interpreter')

    ans =

    tex
- ex2
  - set(h,'interpreter','none')

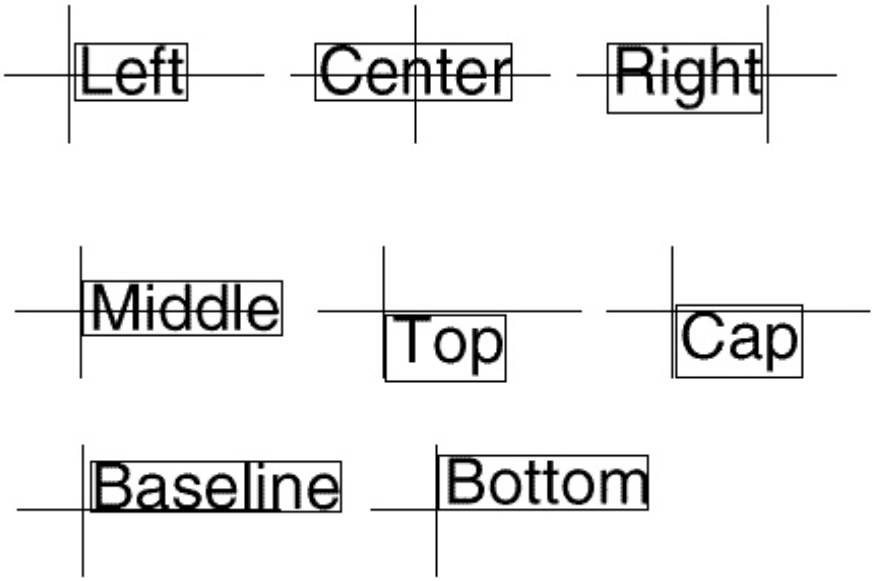
Character Sequence	Symbol	Character Sequence	Symbol	Character Sequence	Symbol
₩alpha	α	₩upsilon	υ	₩sim	$\sim$
₩beta	β	₩phi	φ	₩leq	$\leq$
₩gamma	γ	₩chi	χ	₩infty	∞
₩delta	δ	₩psi	ψ	₩clubsuit	$\clubsuit$
₩epsilon	ε	₩omega	ω	₩diamondsuit	$\diamondsuit$
₩zeta	ζ	₩Gamma	Γ	₩heartsuit	$\heartsuit$
₩eta	η	₩Delta	Δ	₩spadesuit	$\spadesuit$
₩theta	θ	₩Theta	Θ	₩leftrightarrow	$\leftrightarrow$
₩vartheta	υ	₩Lambda	Λ	₩leftarrow	$\leftarrow$
₩iota	ι	₩Xi	Ξ	₩uparrow	$\uparrow$
₩kappa	κ	₩Pi	Π	₩rightarrow	$\rightarrow$
₩lambda	λ	₩Sigma	Σ	₩downarrow	$\downarrow$
₩mu	μ	₩Upsilon	Υ	₩circ	$\circ$
₩nu	ν	₩Phi	Φ	₩pm	$\pm$
₩xi	ξ	₩Psi	Ψ	₩geq	$\geq$
₩pi	π	₩Omega	Ω	₩propto	$\propto$
₩rho	ρ	₩forall	$\forall$	₩partial	∂
₩sigma	σ	₩exist	$\exists$	₩bullet	$\bullet$
₩varsigma	ζ	₩ni	₩θ	₩div	$\div$
₩tau	τ	₩cong	$\cong$	₩neq	$\neq$
₩equiv	$\equiv$	₩approx	$\approx$	₩aleph	$\aleph$
₩Im	$\Im$	₩Re	$\Re$	₩wp	$\wp$
₩otimes	$\otimes$	₩oplus	$\oplus$	₩oslash	$\oslash$
₩cap	$\cap$	₩cup	$\cup$	₩supseteq	$\supseteq$
₩supset	$\supset$	₩subseteq	$\subseteq$	₩subset	$\subset$
₩int	$\int$	₩in	$\in$	₩o	o

< 특수 문자표 >

(Latex 문자)

5 text.m

Text object	
Propertyname	Propertyvalue
HorizontalAlignment	{left} | center | right
VerticalAlignment	Top | cap | {middle} | baseline | bottom



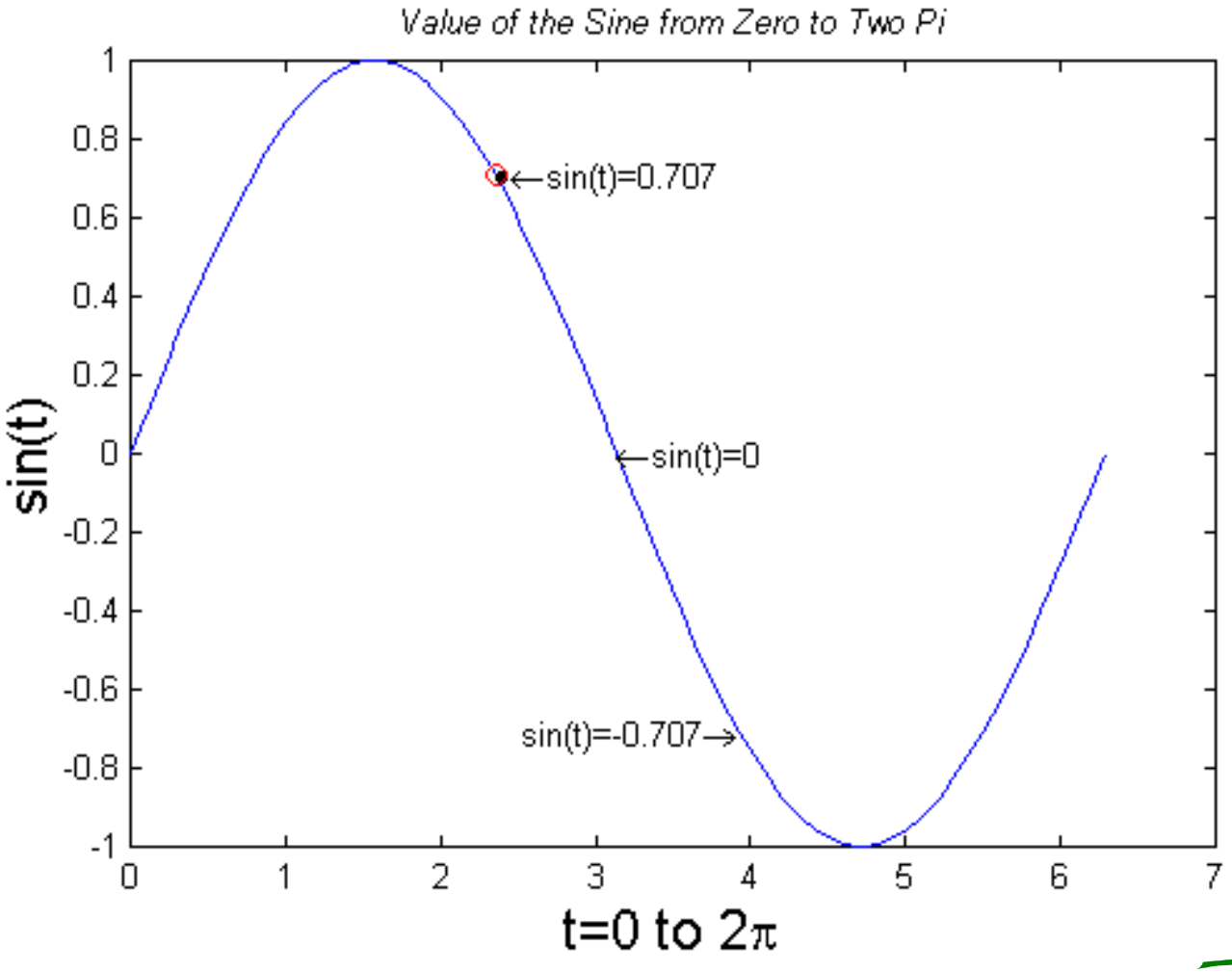
6 text.m

Matlab 명령어	*해당 명령어의 설명*
Zoom on	확대시키고 싶은 영역에서 mouse 의 왼쪽 버튼을 click 하면 화면이 확대, 오른쪽버튼을 click 하면 축소
Zoom off	zoom 기능을 없앤다
Zoom xon	X 축에 대해서만 확대
Zoom yon	Y 축에 대해서만 확대
Zoom out	원래의 figure 로 돌아감

7 text.m

- **ex4**

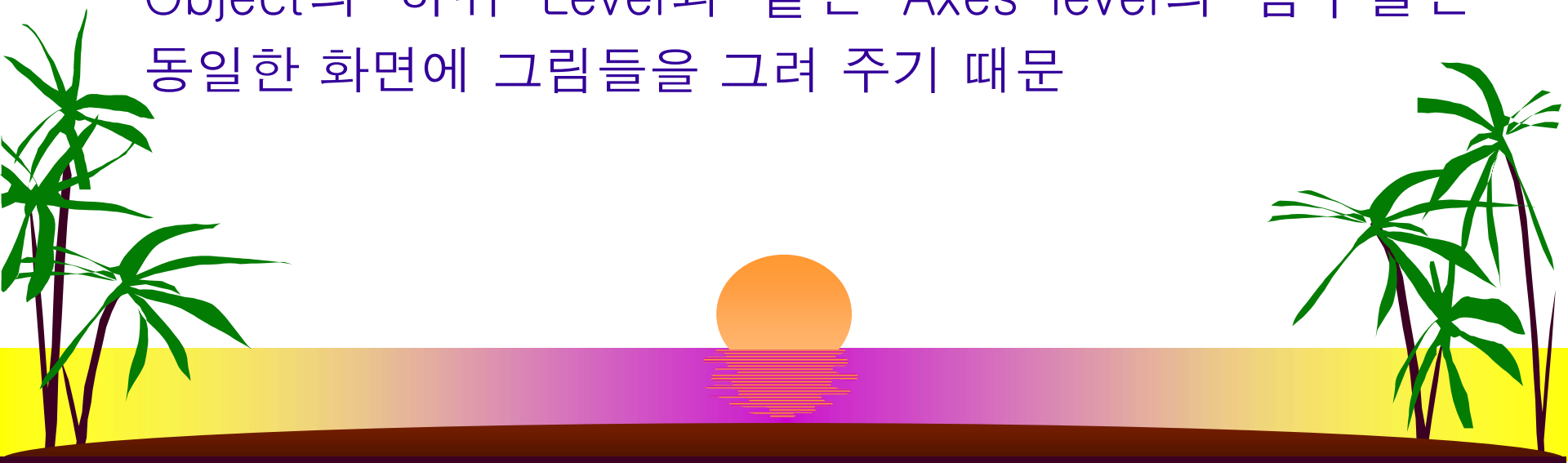
```
t=0:pi/100:2*pi;
y=sin(t);
plot(t,y)
xlabel('t=0 to 2\pi','fontsize',16)
ylabel('sin(t)','fontsize',16)
title('\it{Value of the Sine from Zero to Two Pi}')
set(gcf,'color','w')
text(3*pi/4,sin(3*pi/4),'\bullet\leftarrowsin(t)=0.7
   07')
set(gca,'nextplot','add')
plot(3*pi/4,sin(3*pi/4),'ro')
text(pi,sin(pi),'\leftarrowsin(t)=0')
text(5*pi/4,sin(5*pi/4),...
   'sin(t)=-0.707₩rightarrow','Horizontalalignment','right')
set(gca,'nextplot','replace')
```


Value of the Sine from Zero to Two Pi
sin(t)
t=0 to 2π
←sin(t)=0.707
←sin(t)=0
sin(t)=-0.707→
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6
7

< 문자열의 정렬 방법 >

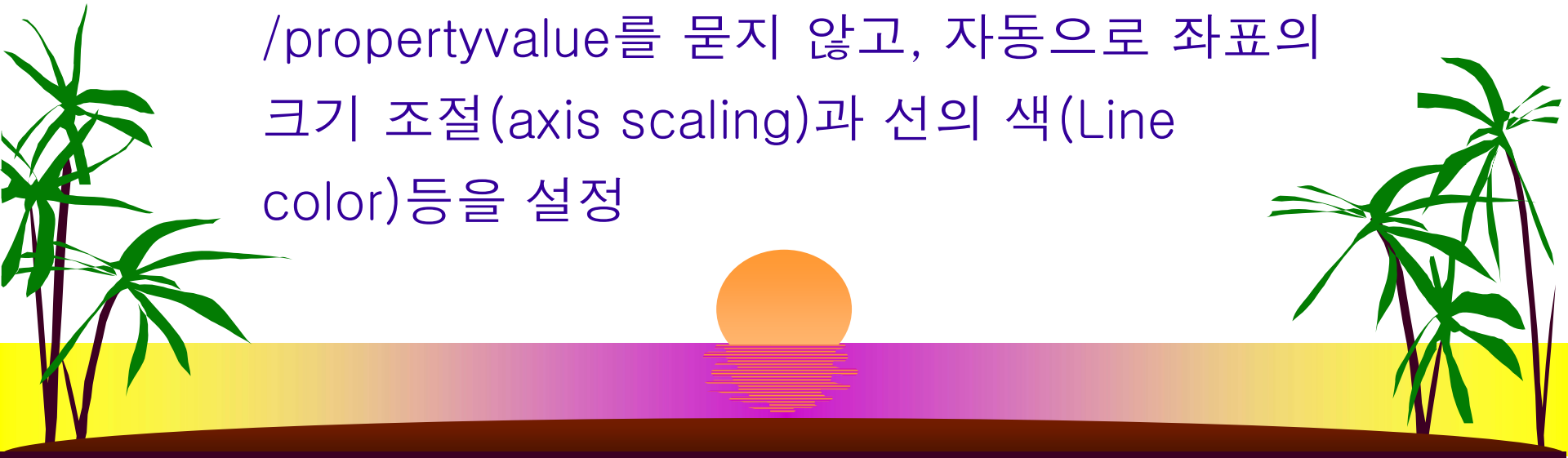
8 text.m

- figure Object, Axes Object처럼 상위 Level의 default property value를 바꾸었다면, **set(gca,'next-plot',’replace')** 와 같이, 다시 default propertyvalue로 환원
- 환원해 주지 않으면, 앞으로 만들어지는 모든 Axes Object의 하위 Level과 같은 Axes level의 함수들은 동일한 화면에 그림들을 그려 주기 때문



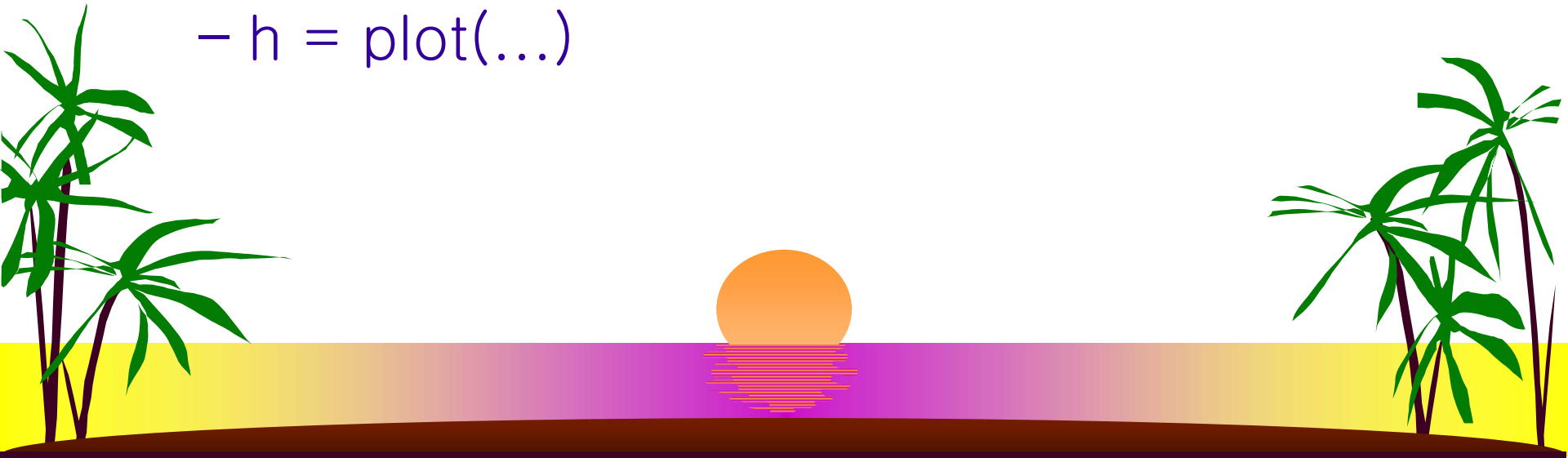
High_level function

- High_level function
  - 데이터를 화면에 display하기 위해 사용되는 함수
  - Low_level functions처럼 데이터를 display하는데, 필요한 여러 가지 propertyname /propertyvalue를 묻지 않고, 자동으로 좌표의 크기 조절(axis scaling)과 선의 색(Line color)등을 설정



1 Plot.m

- Syntax
  - plot(Y)
  - plot(X1,Y1,...)
  - plot(X1,Y1,LineSpec,...)
  - plot(...,'PropertyName',PropertyValue,...)
  - h = plot(...)



2 Plot.m

- Ex5
  - X=(1:10; 0.7*[1:10]; 0.5*[1:10]; 0.25*[1:10])';
  - plot(X)
  - xlabel('x axis','fontsize',15)
  - ylabel('y axis','fontsize',15)
  - title('₩bf{''plot.m''함수의 이용법}','fontsize',15)

2 Plot.m

- Ex5
  - X=(1:10; 0.7*[1:10]; 0.5*[1:10]; 0.25*[1:10])';
  - plot(X)
  - xlabel('x axis','fontsize',15)
  - ylabel('y axis','fontsize',15)
  - title('₩bf{''plot.m''함수의 이용법}','fontsize',15)

3 Plot.m

- **Ex6**

  □Line_Color =get(gca,'colororder')

  Line_Color =

  ```
            0            0    1.0000
            0    0.5000            0
       1.0000            0            0
            0    0.7500    0.7500
       0.7500            0    0.7500
       0.7500    0.7500            0
       0.2500    0.2500    0.2500
  ```

- **Ex7**

  □Line_Type =get(gca,'Linestyleorder')

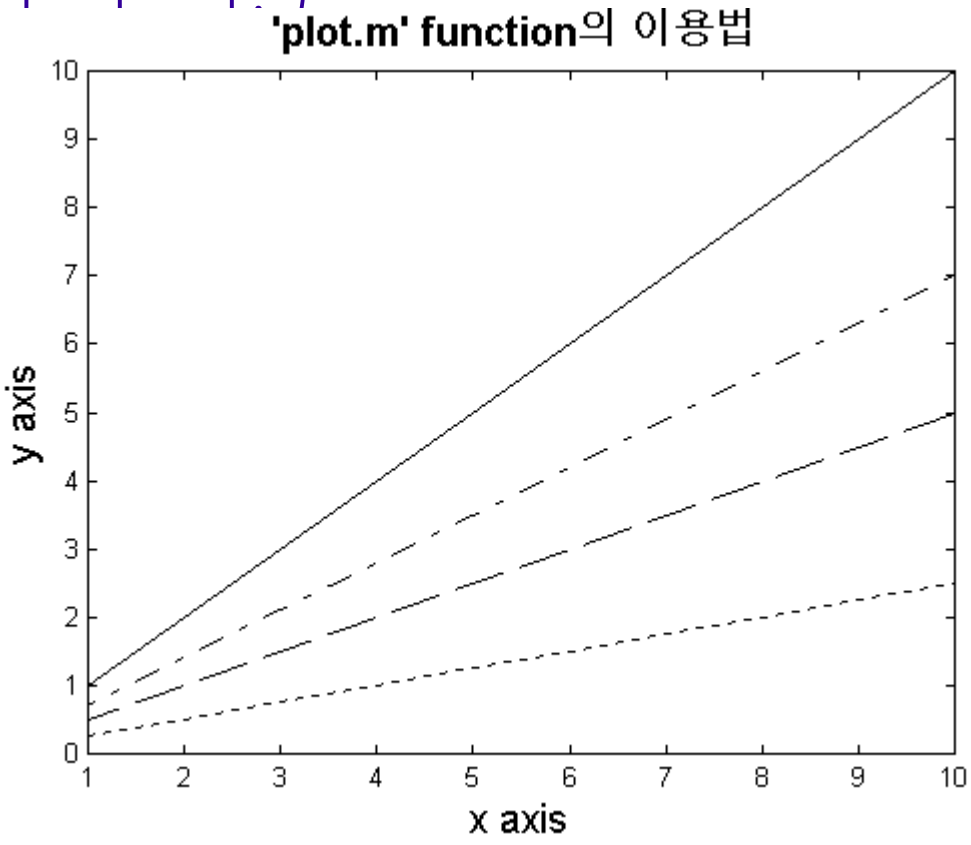
  Line_Type =

  -

4 Plot.m

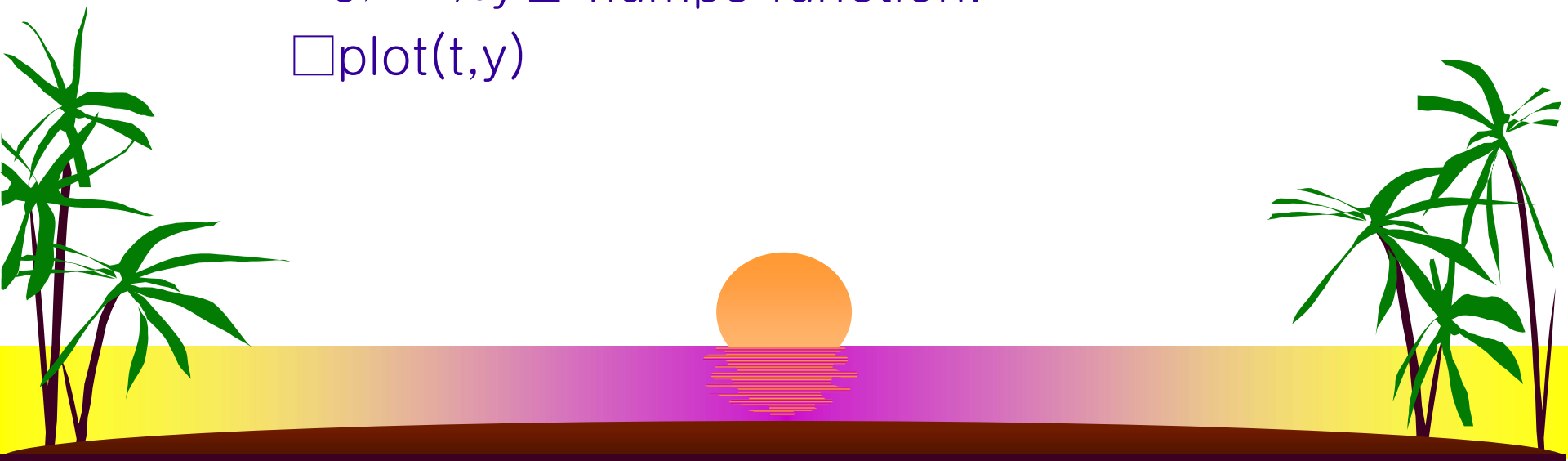
◆Ex8

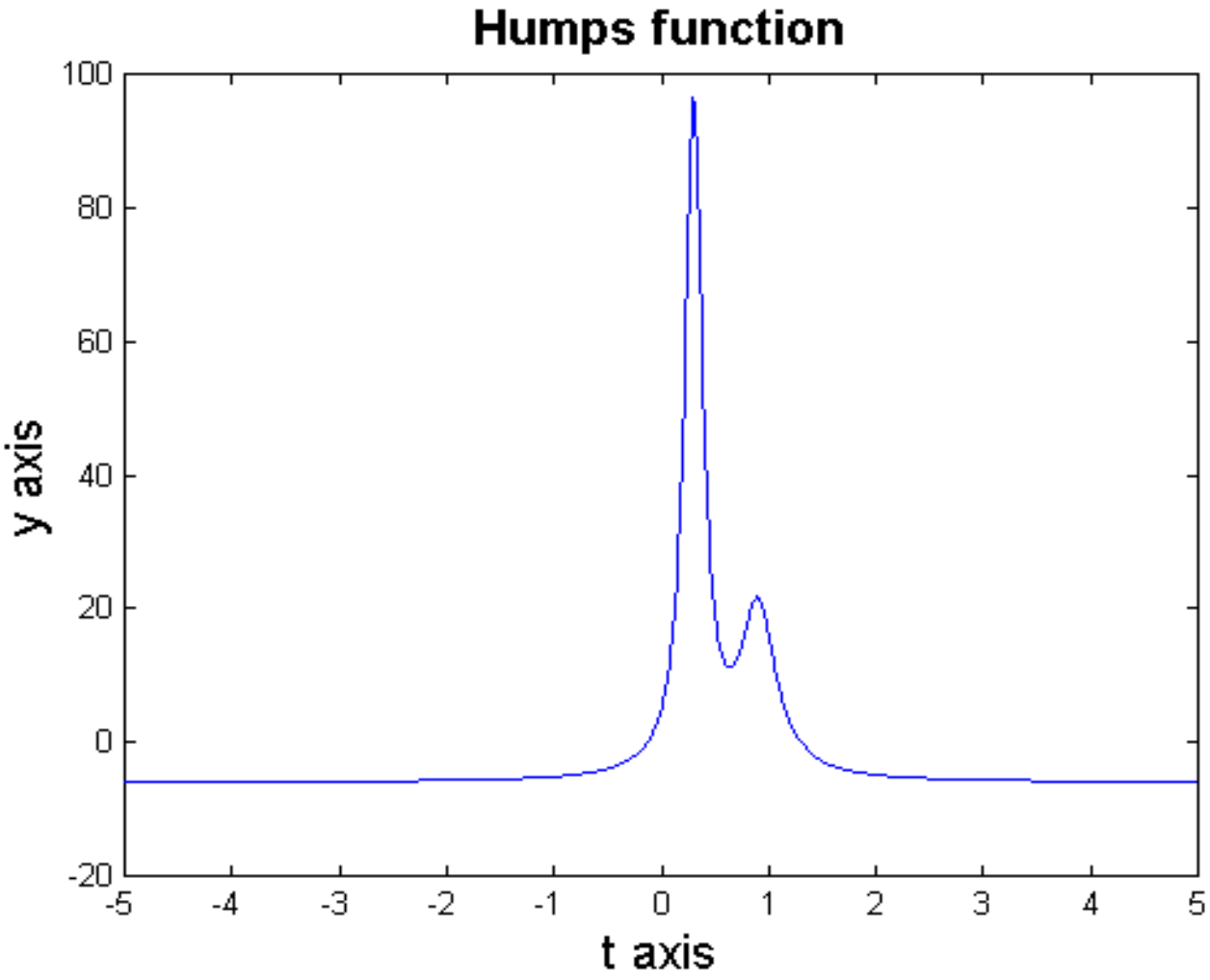
□set(0 , 'DefaultAxesColororder' , [0 0 0] , 'DefaultAxesLineStyleOrder' , '-|-.|--|:')



1 Axis.m

- syntax
  - axis([xmin xmax ymin ymax zmin zmax])
    - ◆ex9
      - □t=-5:1/100:5;
      - □y=1./((t-0.3).^2+0.01)+1./((t-0.9).^2+0.04)-6; %y는 humps function.
      - □plot(t,y)

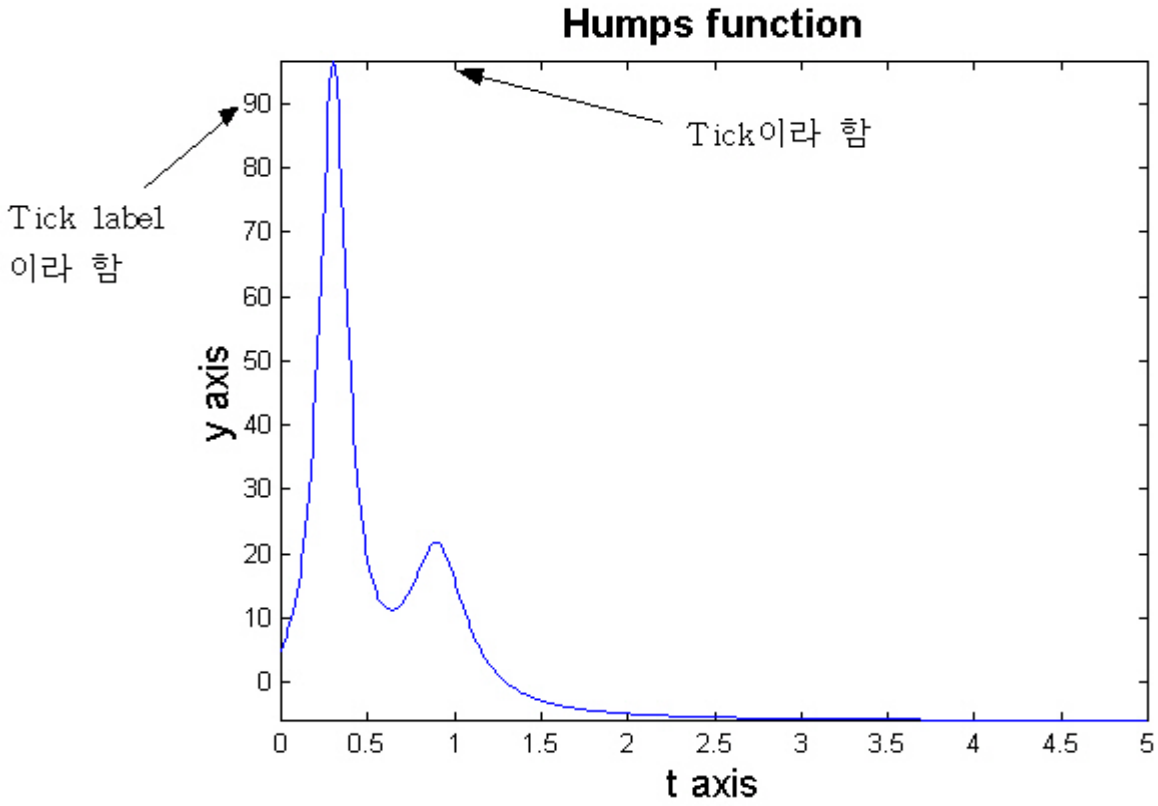




< “axis.m” 함수 사용의예 >

2 Axis.m

- Ex10
  - axis([0 inf -inf inf])
  - set(gca,'xlim',[0 inf],'ylim',[-inf inf])



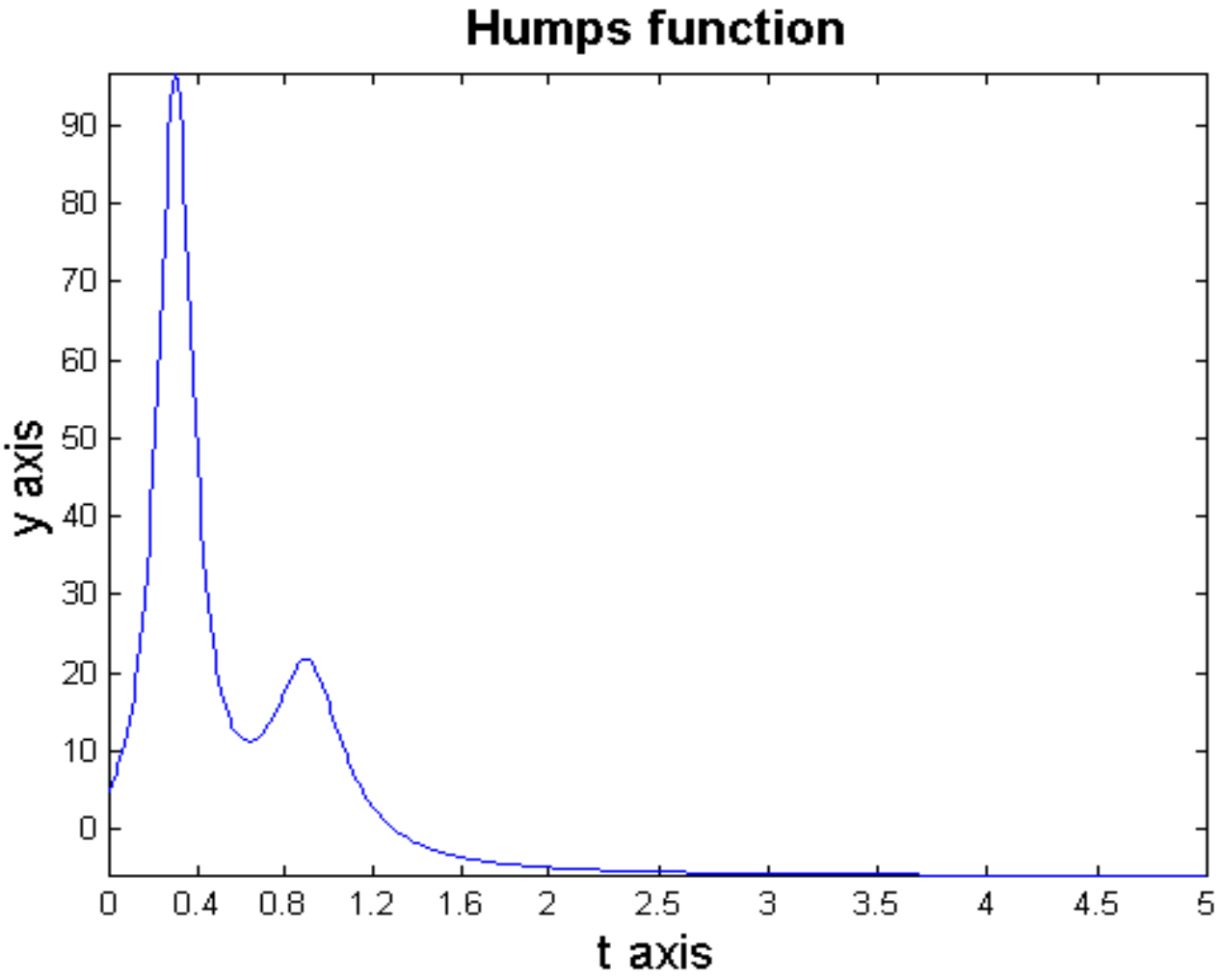
[그림 3-21] t축의 범위를 바꾼 경우

3 Axis.m

Axes object	
Propertyname	Propertyvalue
Xtick, ytick, ztick	Tick mark 를 위치시킬 수 있는 수치 vector

◆**Ex11**

□set(gca,'xtick',[0:0.4:2 2.5 3 3.5 4 4.5 5])



< Tick의 위치 변경 방법>

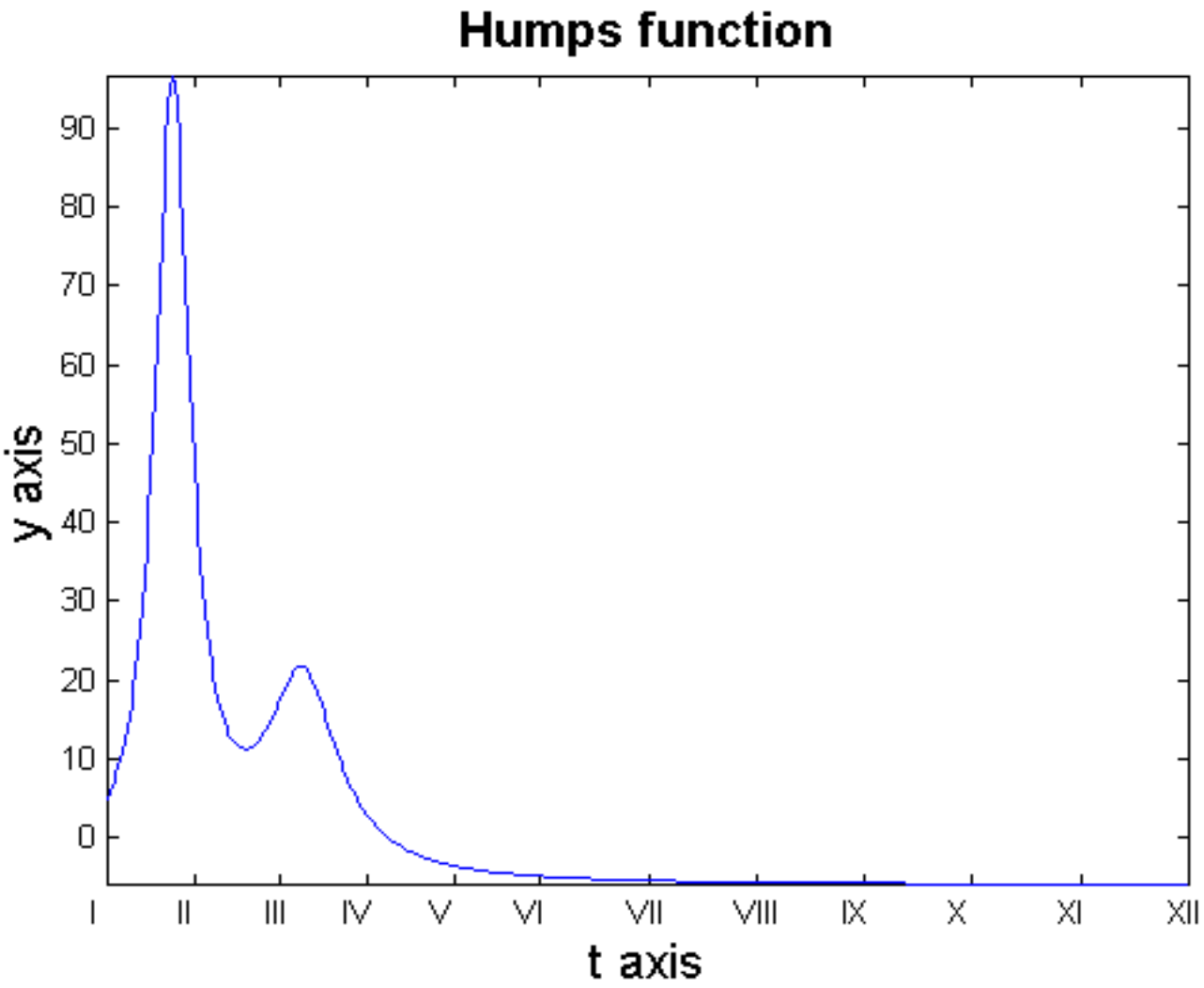
4 Axis.m

Axes object	
Propertyname	Propertyvalue
Xticklabel, yticklabel, zticklabel	Tick mark 의 위치에 놓을 문자열(string)

◆**Ex12**

□t_label=str2mat('I','II','III','IV','V','VI','VII','VIII',
'IX','X','XI','XII')

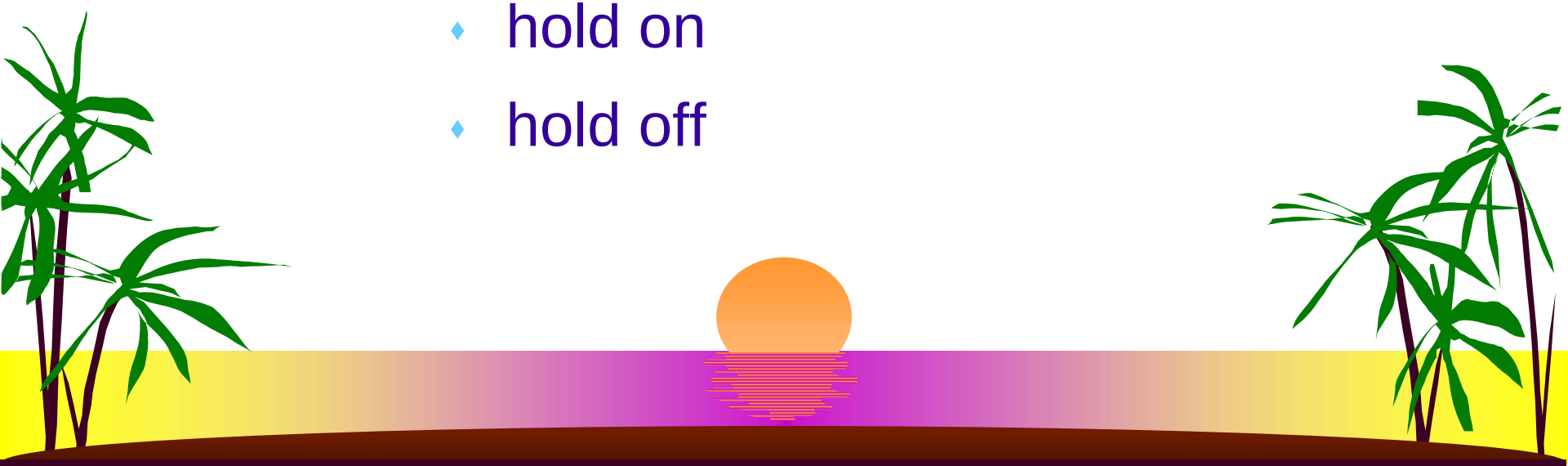
□set(gca,'xticklabel',t_label)



< xticklable의 변경 방법>

Grid

- xgrid, ygrid, zgrid
- gridlinestyle
- grid on
- grid off
- hold on
- hold off

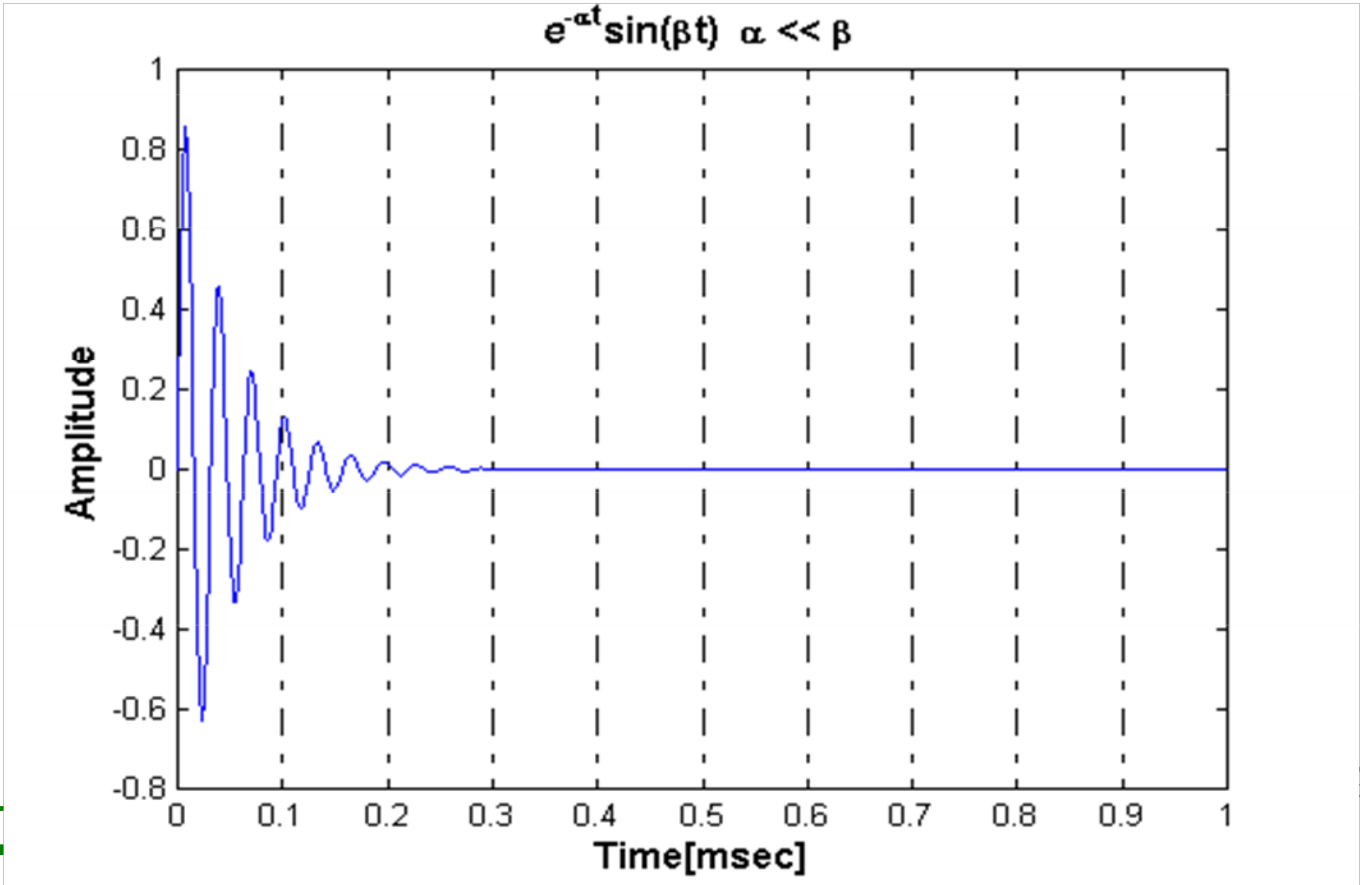


Grid의 예

```
t=0:1/1000:1;
beta=200;
alpha=20;
y=exp(-alpha*t).*sin(beta*t);
plot(t,y)
xlabel('\bf{Time[msec]}','fontsize',12)
ylabel('\bf{Amplitude}','fontsize',12)
title('\{bf{\ite}exp^{\alphat}sin(\betat)\alpha<</\beta}'...
      ,'fontsize',12)
set(gcf,'color',w')
```

x축에만 grid를 첨가

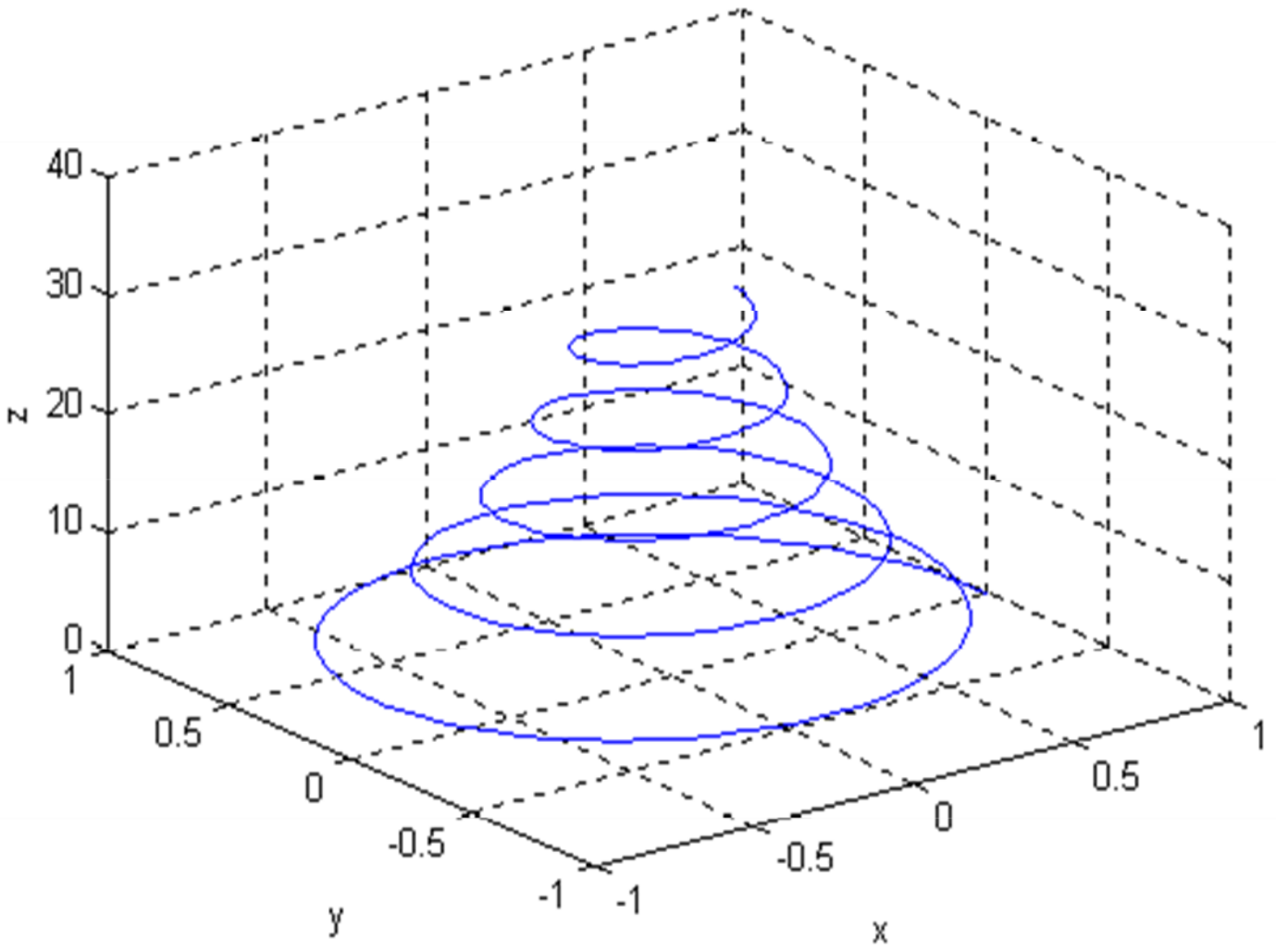
```
set(gca,'xgrid','on','gridlinestyle','-')
```



plot3.m

```
t=0:.1:10*pi;
x=exp(-t/20).*cos(t);
y=exp(-t/20).*sin(t);
z=t;
plot3(x,y,z)
grid on
xlabel('x');
ylabel('y');
zlabel('z');
title('\bf{'plot3.m',funtion의 이용법!}','fontsize',12)
set(gcf,'color','w')
```

'plot3.m' function의 이용법!



xlabel.m, ylabel.m, zlabel.m- text object

- Text object에서 Rotation - Degree의 단위로 문자의 방향을 결정

  예) rotation

  h=zlabel('z');

  set(h,'rotation',180);

- Axes object - 'Box on' or 'Box off

  예) box

  set(gca, 'box', 'on');

contour.m

- 3차원 데이타에 대한 등고선
- 사용방법

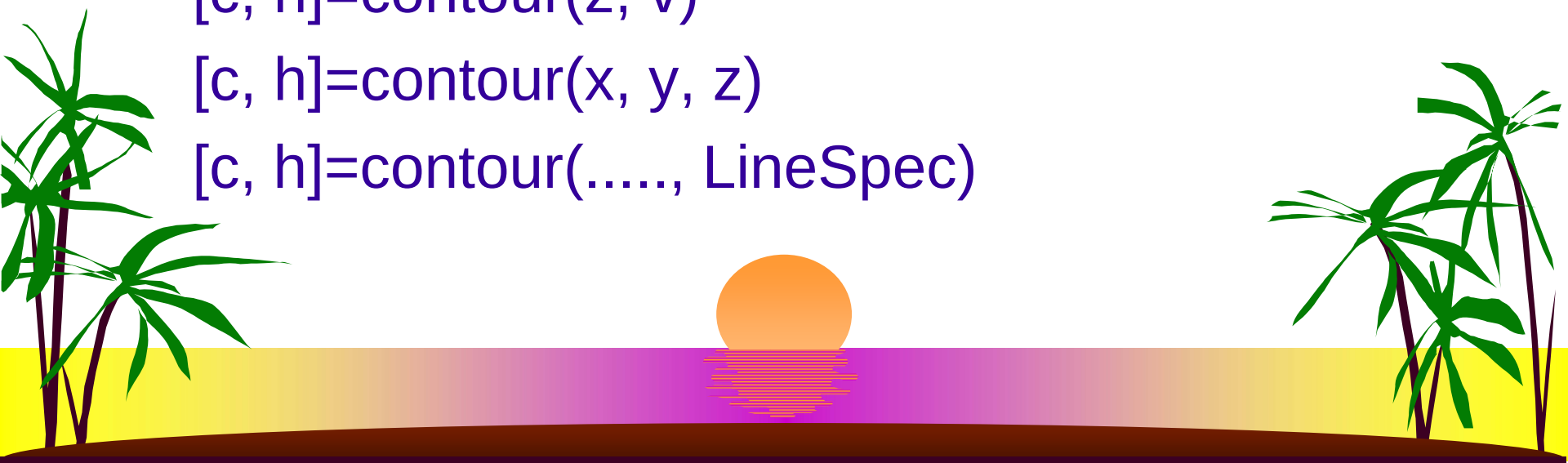
  [c, h]=contour(z)

  [c, h]=contour(z, n)

  [c, h]=contour(z, v)

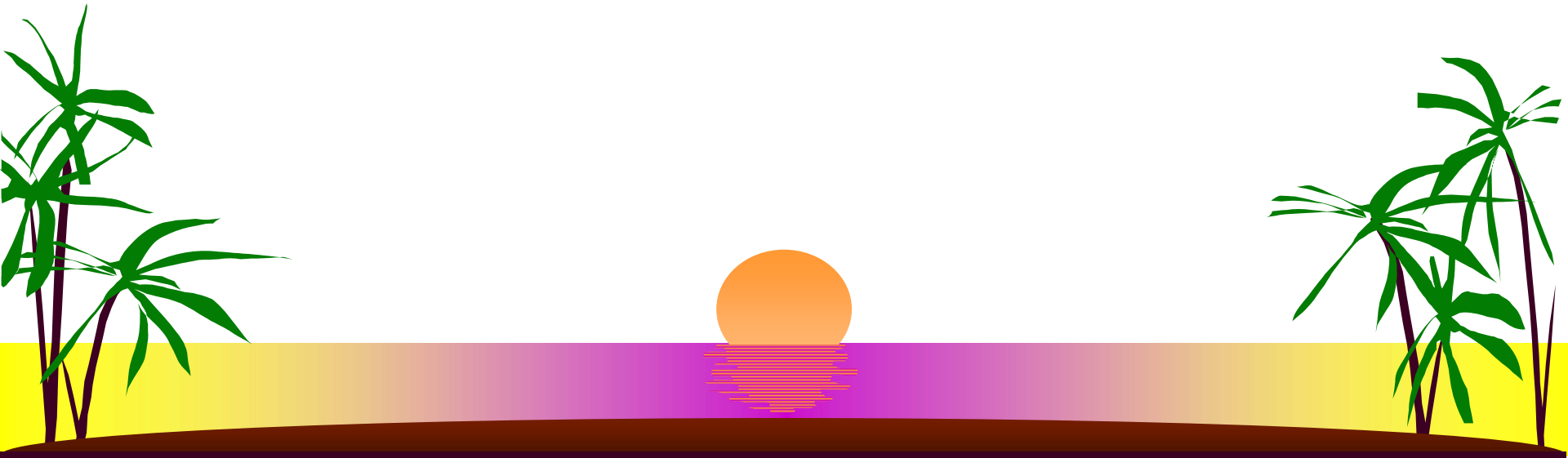
  [c, h]=contour(x, y, z)

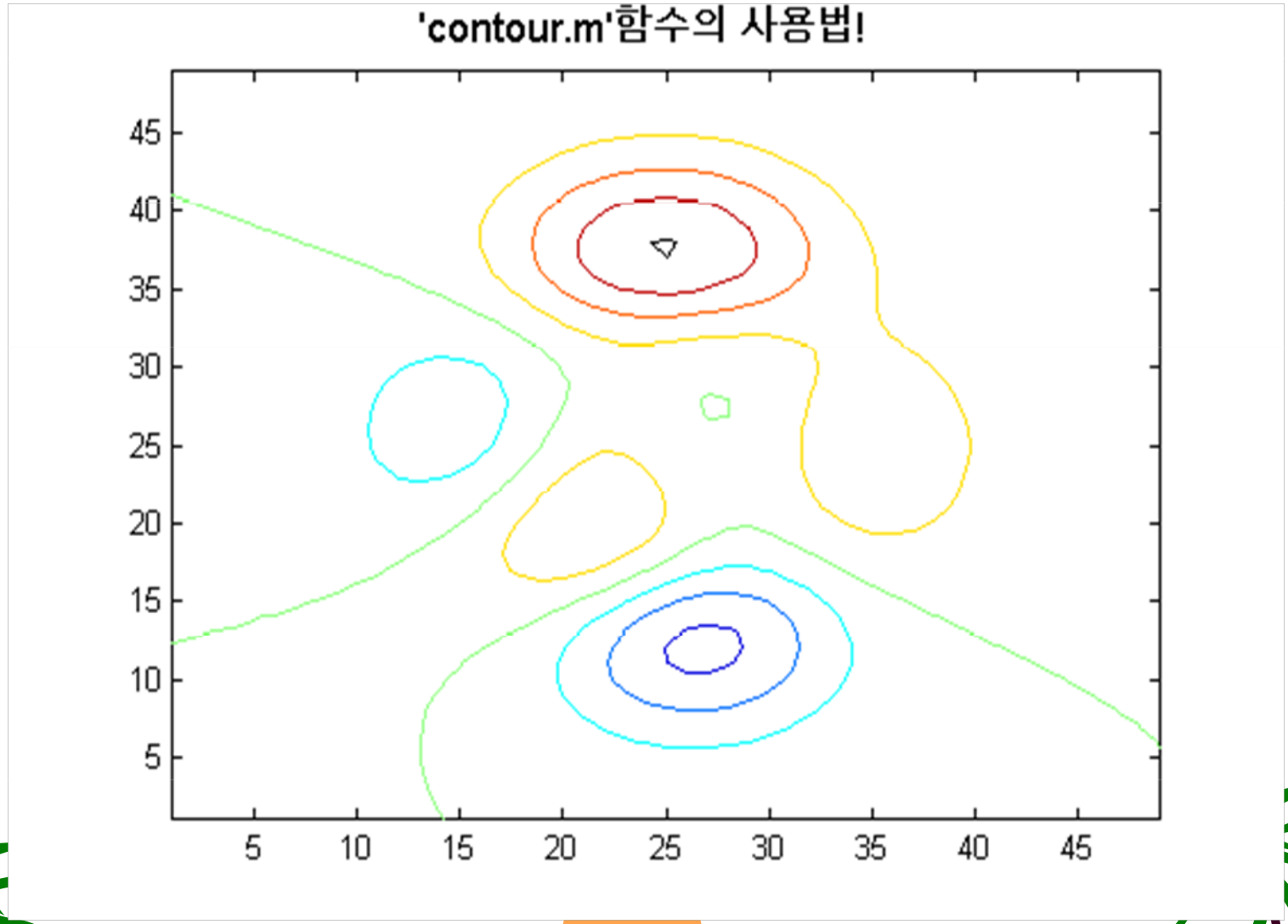
  [c, h]=contour(....., LineSpec)



contour.m의 예

```
z =peaks;        %matlab이 제공하는 sample함수
[c, h]=contour(z);
set(gcf, ‘color’, ‘w’)
title(‘\bf{‘‘contour.m’’ 함수의 사용법! }’,‘fontsize’,12)
```




'contour.m'함수의 사용법!
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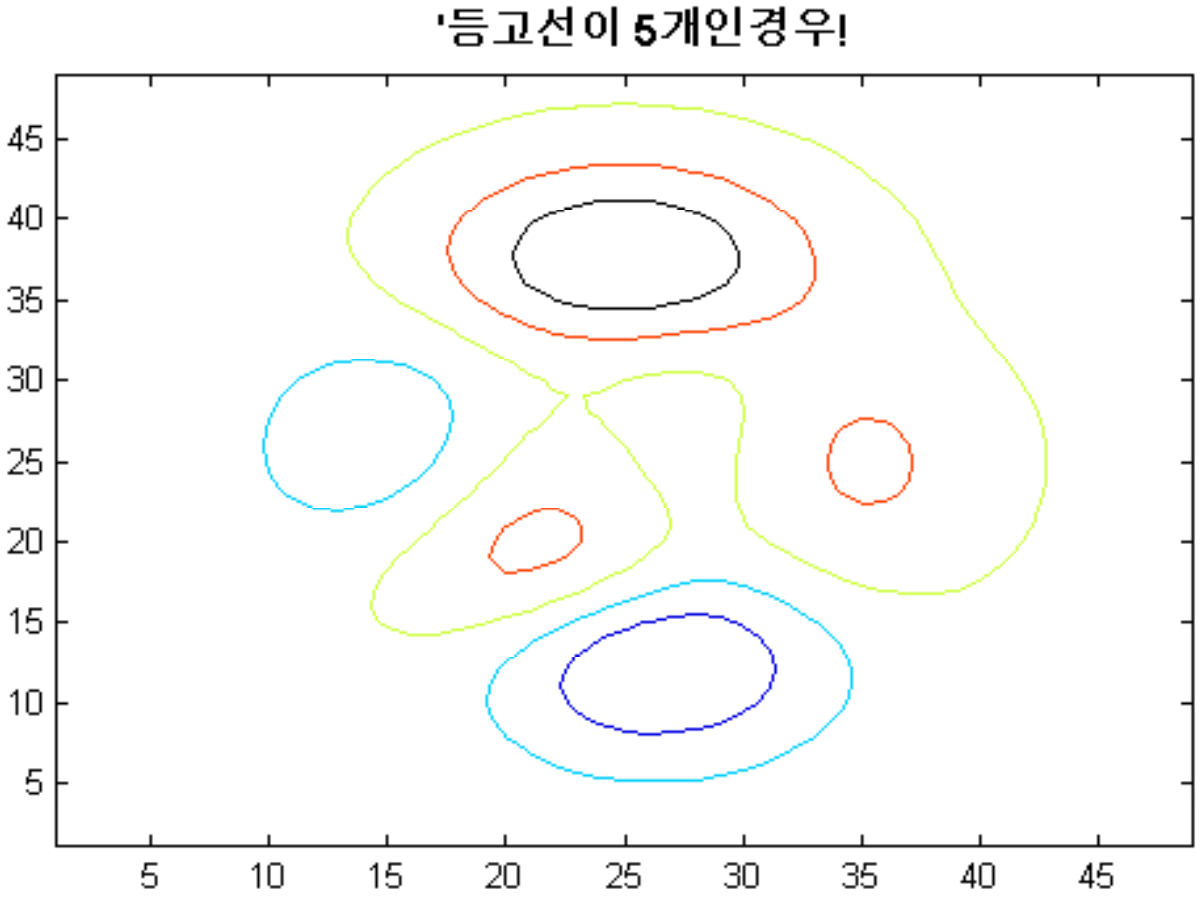
[c, h]=contour(z, 5)



clabel.m

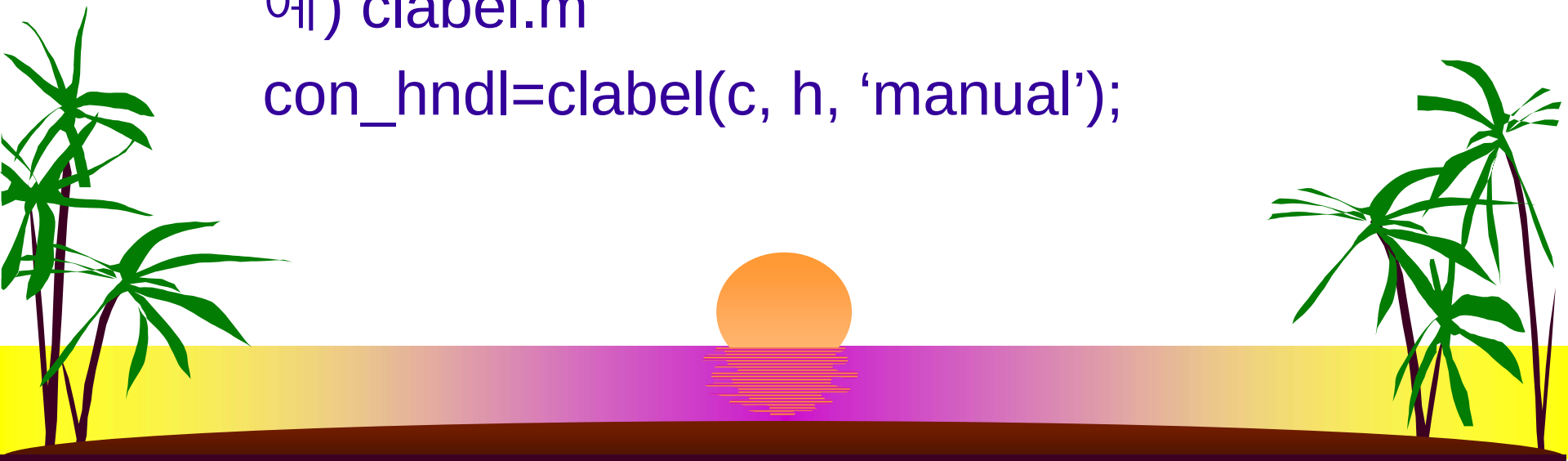
- 사용방법

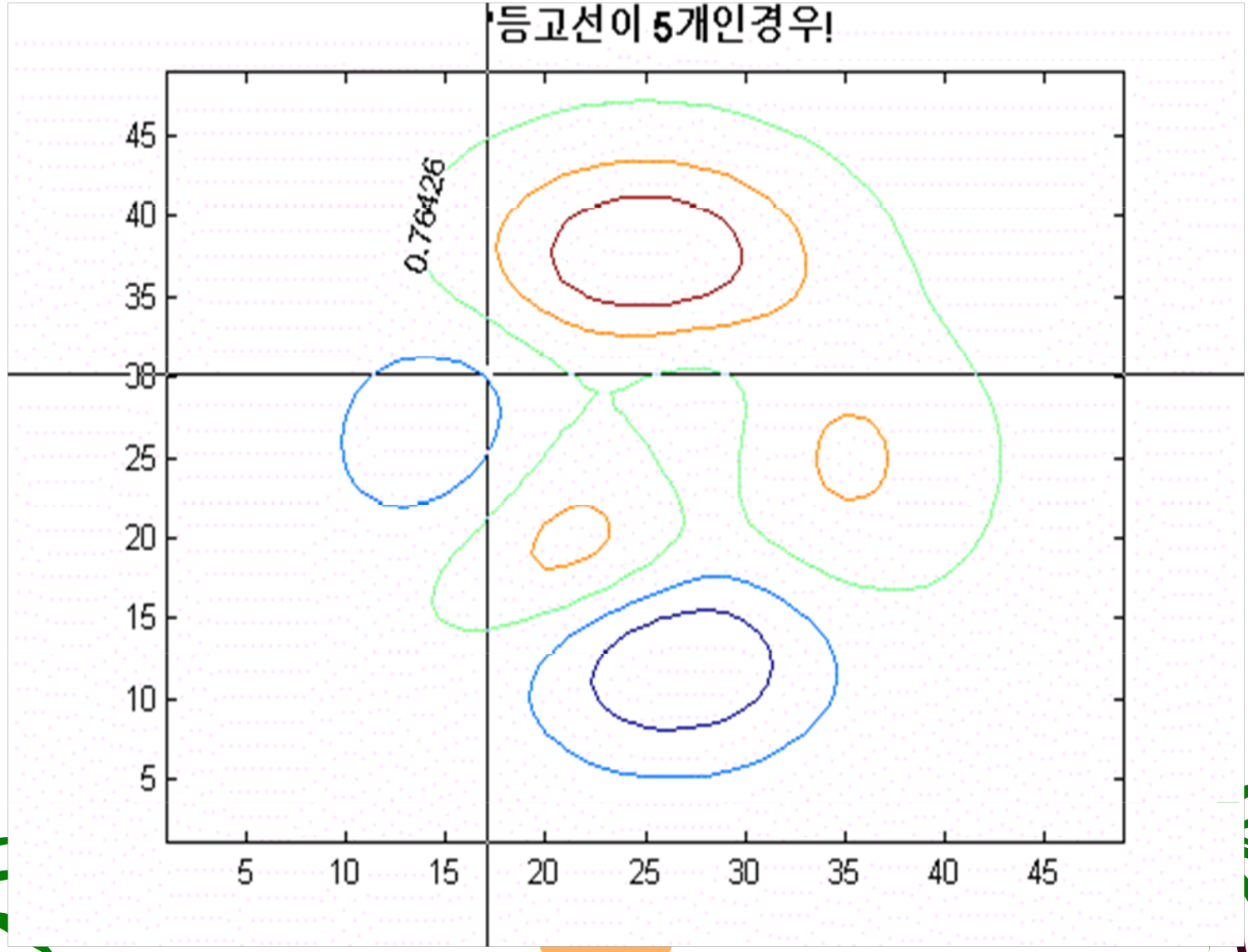
  clabel(c, v)

  clabel(c, h, ‘manual’)

예) clabel.m

con_hndl=clabel(c, h, ‘manual’);




등고선이 5개인경우!
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contour3.m

- 사용방법

  [c, h]=contour3(z)

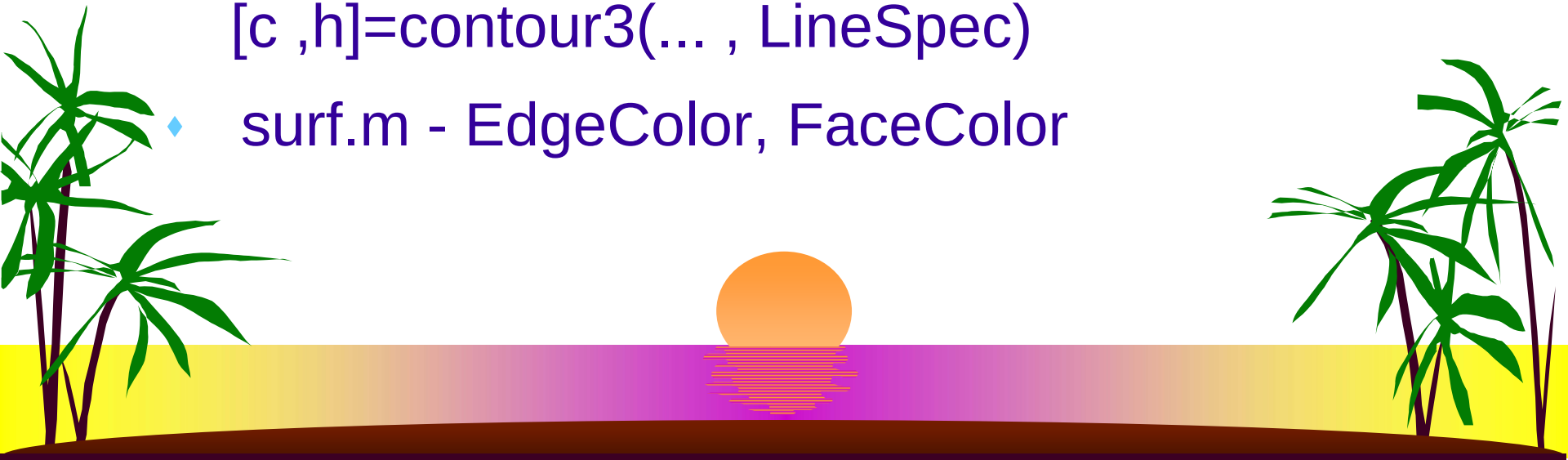
  [c,h]=contour3(z, n)

  [c, h]=contour3(z, v)

  [c, h]=contour3(x, y, z)

  [c ,h]=contour3(... , LineSpec)

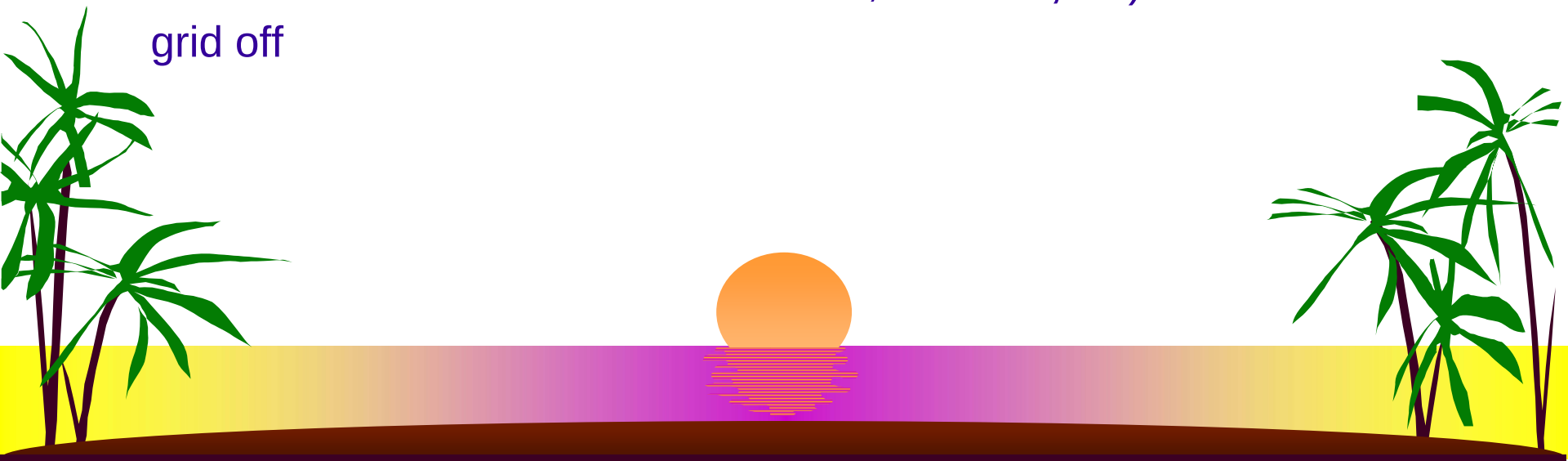
- surf.m - EdgeColor, FaceColor



contour3.m의 예

```
[X,Y]=meshgrid([-2:.25:2]);
Z=X.*exp(X.^2-Y.^2);
contour3(X,Y,Z,30)
hold on
h=surf(X,Y,Z);
set(h,'edgecolor',[.8.8.8],…
      'facecolor', 'none')
hold off
grid off
```

```
view(-15,25)   %방위각:-15, 고도:25
colormap cool
set(gcf,'color','w')
xlabel('x');
ylabel('y');
zlabel('z');
title('\bf{"contour3.m"funtion의,.이용법}
     ','fontsize', 12)
```



'contour3.m' function의 이용법!