```
%%    3_d plot:

clc

clear

close all


%% 3D line plot

%{

z_array = linspace(0,29,1000) ;

x_array = exp(z_array./10).*sin(5*z_array) ;

y_array = exp(z_array./10).*cos(5*z_array) ;


figure(1)

plot3(x_array,y_array,z_array,'LineWidth',1.5,'Color',[0.2 0.3 0.6])

grid on

box on

xlim([min(x_array) max(x_array)])

ylim([min(y_array) max(y_array)])

ax = gca;

ax.FontSize = 14;

ax.LineWidth = 1;

xlabel("x-axis",'FontSize', 15, 'FontWeight', 'bold','Color','red','Rotation',20)

ylabel("y-axis")

%view([6,6,130])

%xticks([-2 -1.5 1 2]);

%xticklabels({'Low', 'Medium', 'High'});


%}









x_array = linspace(-2,2,15) ;
```

```
y_array = linspace(-2,2,15) ;

[x_grid,y_grid] = meshgrid(x_array,y_array) ;

F = x_grid.*exp(-x_grid.^2-y_grid.^2);



%% 3D mesh plot

%{
figure(2)
mesh(x_grid,y_grid,F)
xlim([min(x_array) max(x_array)])
ylim([min(y_array) max(y_array)])
ax = gca;
ax.FontSize = 14;
ax.LineWidth = 1;
xlabel("x-axis",'FontSize', 15, 'FontWeight', 'bold','Color','red','Rotation',20)
ylabel("y-axis")
%xticks([-2 -1.5 1 2]);
%xticklabels({'Low', 'Medium', 'High'});
colorbar

%}









%% 3D surface plot
```

```
%{
figure(3)
surf(x_grid,y_grid,F, 'EdgeColor', 'none')
xlim([min(x_array) max(x_array)])
ylim([min(y_array) max(y_array)])
%grid off
grid minor
box on
ax = gca;
ax.FontSize = 14;
ax.LineWidth = 1;
xlabel("x-axis",'FontSize', 15, 'FontWeight', 'bold','Color','red','Rotation',20)
ylabel("y-axis")
%xticks([-2 -1.5 1 2]);
%xticklabels({'Low', 'Medium', 'High'});
colorbar

%}

%% 3D contour plot

%{
```

```
figure(11)
contour(x_grid,y_grid,F,20,'LineWidth', 1.5)
xlim([min(x_array) max(x_array)])
ylim([min(y_array) max(y_array)])
ax = gca;
ax.FontSize = 14;
ax.LineWidth = 2;
xlabel("x-axis",'FontSize', 15, 'FontWeight', 'bold','Color','red')
ylabel("y-axis")
%xticks([-2 -1.5 1 2]);
%xticklabels({'Low', 'Medium', 'High'});
colorbar



%}
```

```
%% Plotting plane wave with damping



%{
```

```
x = linspace(-8*pi, 8*pi, 100) ;

y = linspace(-8*pi, 8*pi, 100) ;

k = 1 ; % angular wavelength

gamma = 0.05 ; % damping

omega = 10 ; % temporal frequency




[x_grid,y_grid] = meshgrid(x,y) ;




t = linspace(0,2*pi,200) ;

for i = 1:length(t)

wave_1 = exp(-0.5*t(i)) .* exp( -gamma.* sqrt(x_grid.^2 +y_grid.^2)) .* sin(k*sqrt(abs(x_grid.^2 +y_grid.^2)) - omega.*t(i) ) ;

%wave_2 = exp( -gamma.* sqrt(x_grid.^2 +y_grid.^2)) .* sin(k*sqrt(x_grid.^2 +y_grid.^2) - omega.*t(i) + phi) ;



figure(21)

surf(x_grid,y_grid,wave_1,'EdgeColor', 'none')

xlim([min(x) max(x)])

ylim([min(y) max(y)])

grid off

shading interp

view([6,6,130])

zlim([-1 1])

%colorbar

caxis([-1 1])


pause(0.02)


end
```

```
%}
```

```
%% Interference of two plane waves
```

```
%{

x = linspace(-8*pi, 8*pi, 100) ;
y = linspace(-8*pi, 8*pi, 100) ;
k = 2 ; % angular wavelength
gamma = 0.05 ; % damping
omega = 10 ; % temporal frequency
phi = 0.4*pi ;
x_0 = 3 ;



[x_grid,y_grid] = meshgrid(x,y) ;



t = linspace(0,2*pi,200) ;
for i = 1:length(t)
```

```
wave_1 = exp(-0.5*t(i)) .* exp( -gamma.* sqrt((x_grid+x_0).^2 +y_grid.^2)) .* sin(k*sqrt(abs((x_grid+x_0).^2 +y_grid.^2)) - omega.*t(i) ) ;

wave_2 = exp(-0.5*t(i)) .* exp( -gamma.* sqrt((x_grid-x_0).^2 +y_grid.^2)) .* sin(k*sqrt(abs((x_grid-x_0).^2 +y_grid.^2)) - omega.*t(i) ) ;



figure(21)

surf(x_grid,y_grid,wave_1+wave_2,'EdgeColor', 'none')

xlim([min(x) max(x)])

ylim([min(y) max(y)])

grid off

shading interp

view([6,6,130])

zlim([-1 1])

%colorbar

caxis([-1 1])



pause(0.02)


end


%}
```