```
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%EXAM
```

```
%Question 1
```

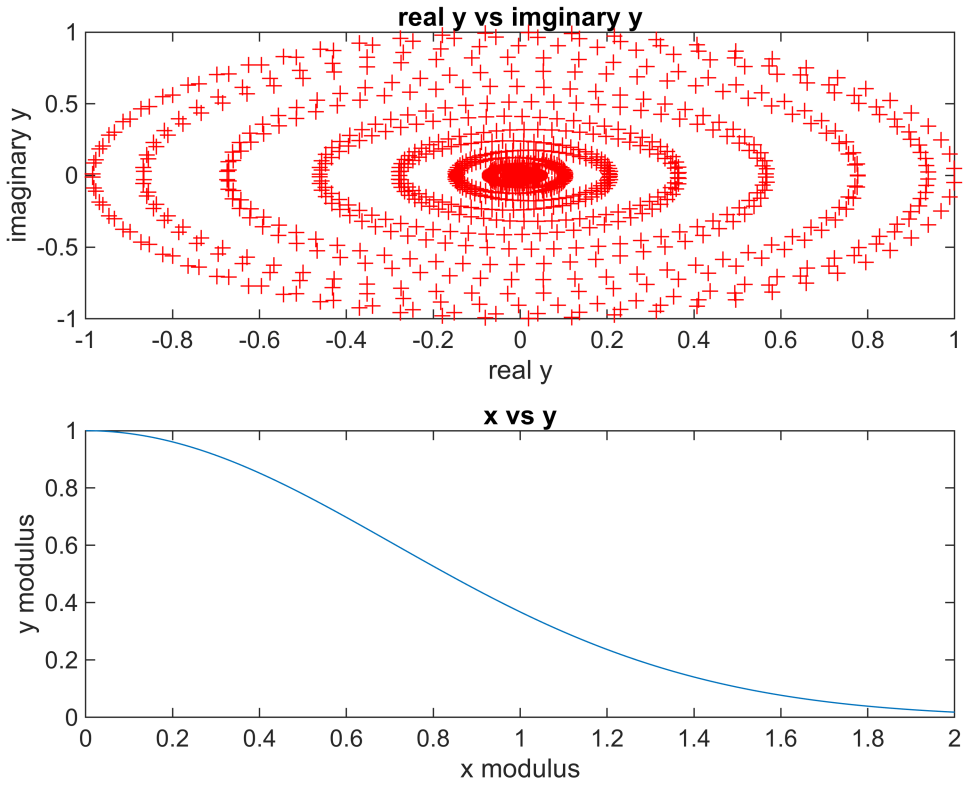
```
x = linspace(-2,2,1000)
```

```
x = 1×1000
   -2.0000   -1.9960   -1.9920   -1.9880   -1.9840   -1.9800   -1.9760   -1.9720 ···
```

```
y = exp(-(x.^2)) .* exp(j*25*x)
```

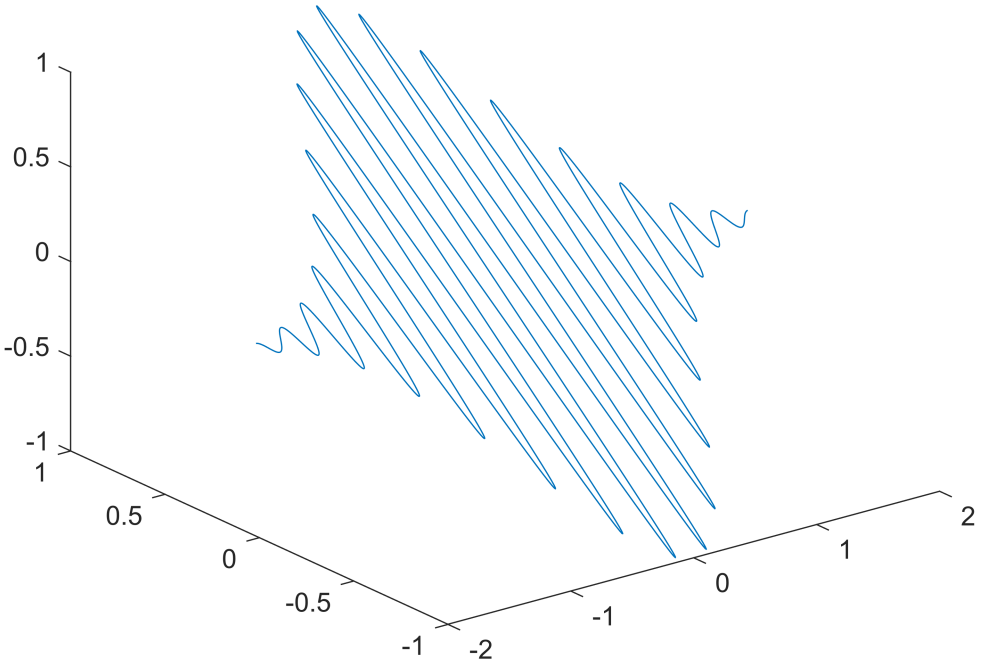
```
y = 1×1000 complex
   0.0177 + 0.0048i   0.0174 + 0.0067i   0.0169 + 0.0085i   0.0162 + 0.0103i ···
```

```
figure
subplot(2,1,1)
plot(y,'r+')
title('real y vs imginary y')
xlabel('real y')
ylabel('imaginary y')

subplot(2,1,2)
plot(abs(x), abs(y))
title('x vs y')
xlabel('x modulus')
ylabel('y modulus')
```




```
figure
plot3(x,y,y)
```

```
Warning: Imaginary parts of complex X, Y, and/or Z arguments ignored
```




```
%Question 2
```

```
A = [2 4 0 8;
     0 -6 -12 9;
     1 2 4 8;
     1 3 9 0];

B = [40; 87; 36; 50];

values = A \ B;

w = values(1)
```

```
w =
84.1053
```

```
x = values(2)
```

```
x =
-28.5789
```

```
y = values(3)
```

```
y =
5.7368
```

```
z = values(4)
```

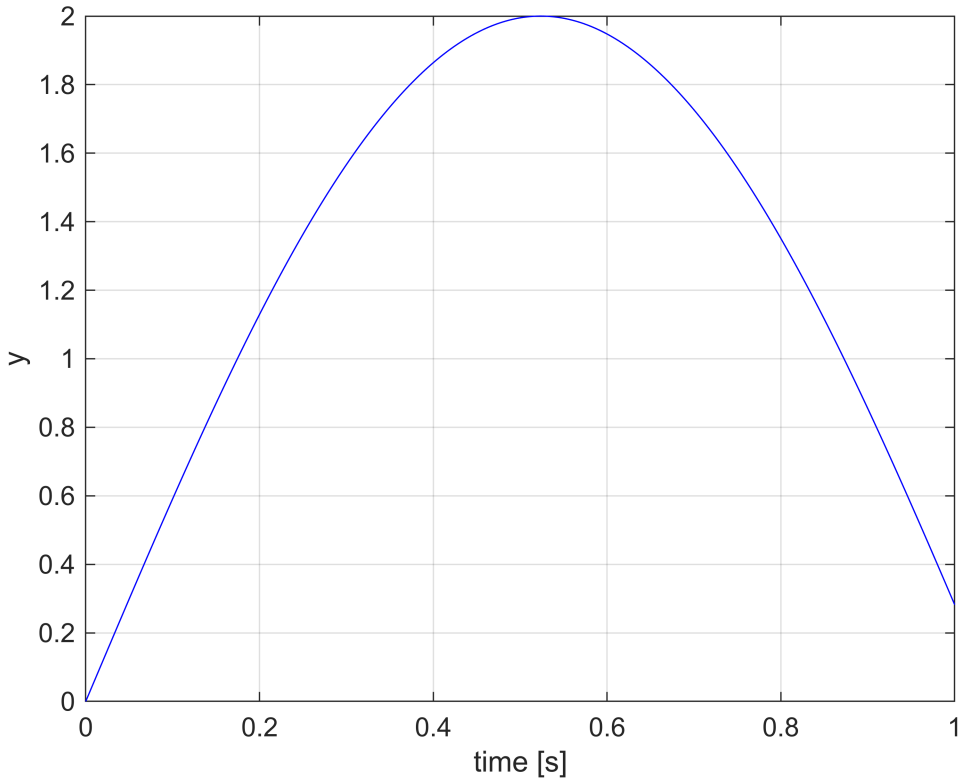
```
z =
-1.7368
```

```
%Question 3
```

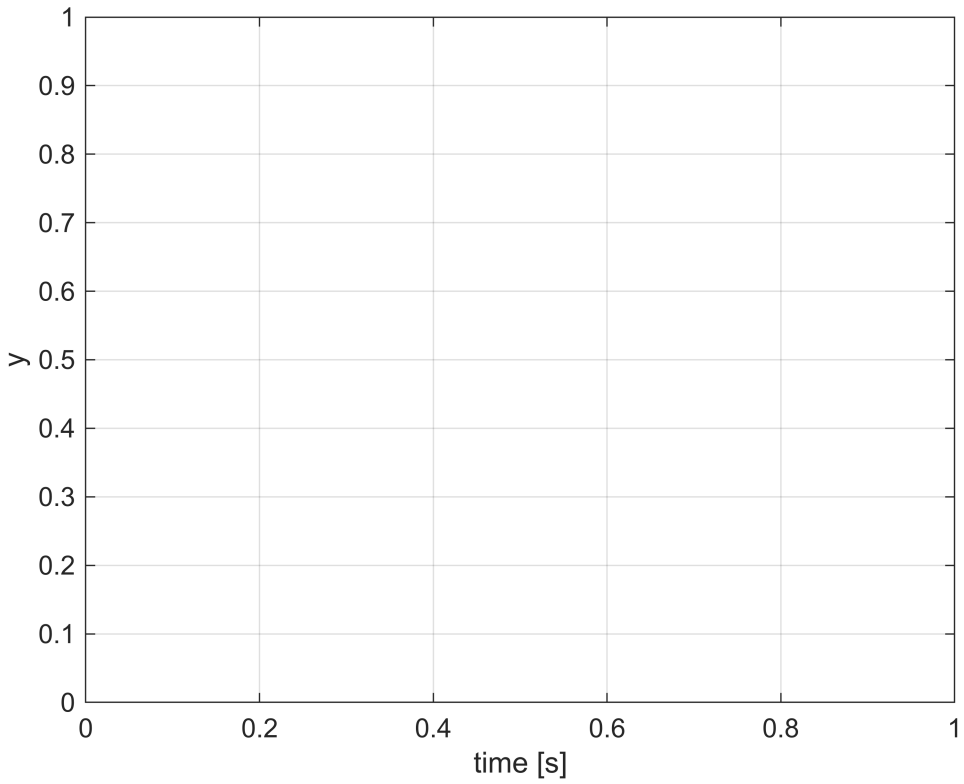
```
t = linspace(0, 1, 1000);

figure
y = sumsin (t, 3, 2);
```

```
y = 1×1000
         0    0.0060    0.0120    0.0180    0.0240    0.0300    0.0360    0.0420 ···
```

```
plot(t, y, 'b'); grid on;
xlabel('time [s]');
ylabel('y');
```




```
figure
y = sumsin(t, 1:2:100, 1./(1:2:100));
plot(t, y, 'b'); grid on;
xlabel('time [s]');
ylabel ('y');
```




```
%Question 4
```

```
t_analytical = linspace(0,1,100)
```

```
t_analytical = 1×100
         0    0.0101    0.0202    0.0303    0.0404    0.0505    0.0606    0.0707 ···
```

```
y_analytical =  5*log(cos(t_analytical)) - 5
```

```
y_analytical = 1×100
   -5.0000   -5.0003   -5.0010   -5.0023   -5.0041   -5.0064   -5.0092   -5.0125 ···
```

```
y0 = -5
```

```
y0 =
-5
```

```
t0 = 0
```

```
t0 =
0
```

```
t_end = 1;
dt = 0.1
```

```
dt =
0.1000
```

```
% Euler
[t_euler, y_euler] = Euler(@righthandside, t_end, dt, t0, y0);

% ode45
[t_ode45, y_ode45] = ode45(@righthandside, [t0 t_end], y0);

% Plot
figure;
plot(t_analytical, y_analytical, 'b', 'DisplayName', 'Analytical Solution');
hold on;
plot(t_euler, y_euler, 'ro', 'DisplayName', 'Euler Method');
plot(t_ode45, y_ode45, 'kx', 'DisplayName', 'ode45 Method');
legend;
xlabel('t');
ylabel('y(t)');
title('ode45 Method VS Euler Method vs Analytical Solution');
hold off;
```