

```
% Name: Saleh Al Alshaikh
% KSU ID: 445102564
% Date: 14/4/2026
% HomeWork5
% clear;
% clc;
format short g
```

```
% Q1
```

```
clc; clear; close all;

t = linspace(0, 2*pi, 1000);

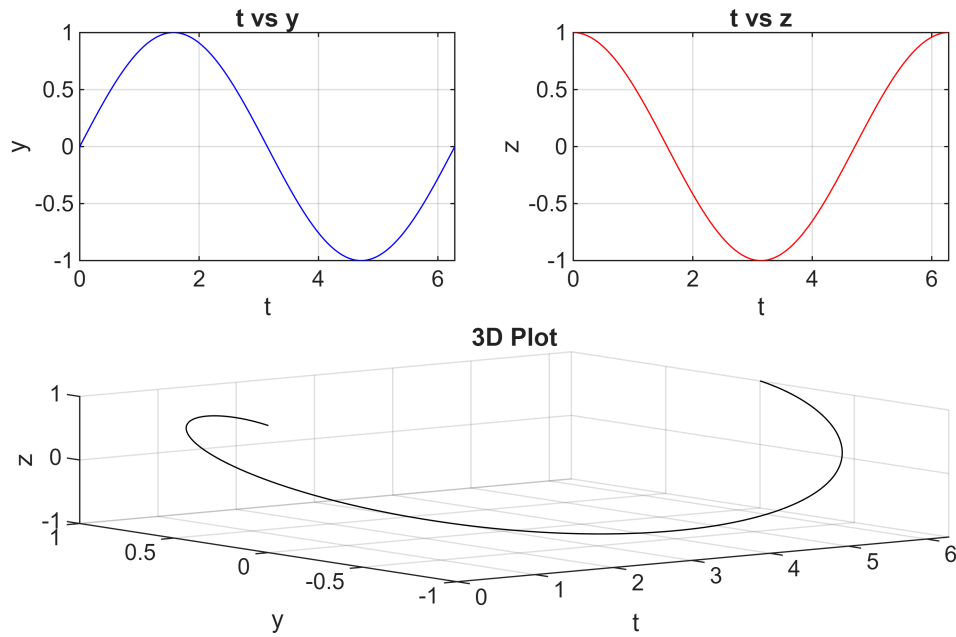
y = sin(t);
z = cos(t);

figure;

subplot(2,2,1)
plot(t, y, 'b')
grid on
xlabel('t'); ylabel('y')
title('t vs y')

subplot(2,2,2)
plot(t, z, 'r')
grid on
xlabel('t'); ylabel('z')
title('t vs z')

subplot(2,2,[3 4])
plot3(t, y, z, 'k')
grid on
xlabel('t'); ylabel('y'); zlabel('z')
title('3D Plot')
```



% Q2

```

clc; clear; close all;

x = linspace(0, 3, 1000);

f = exp(-0.5*x).*cos(2*x);
g = 10*exp(-0.5*x).*(0.5*cos(2*x) + 2*sin(2*x));

figure;

subplot(3,1,1)
plot(x,f,'b--')
grid on
title('f(x)')
xlabel('x'); ylabel('f(x)')

subplot(3,1,2)
plot(x,g,'k')
grid on
title('g(x)')
xlabel('x'); ylabel('g(x)')

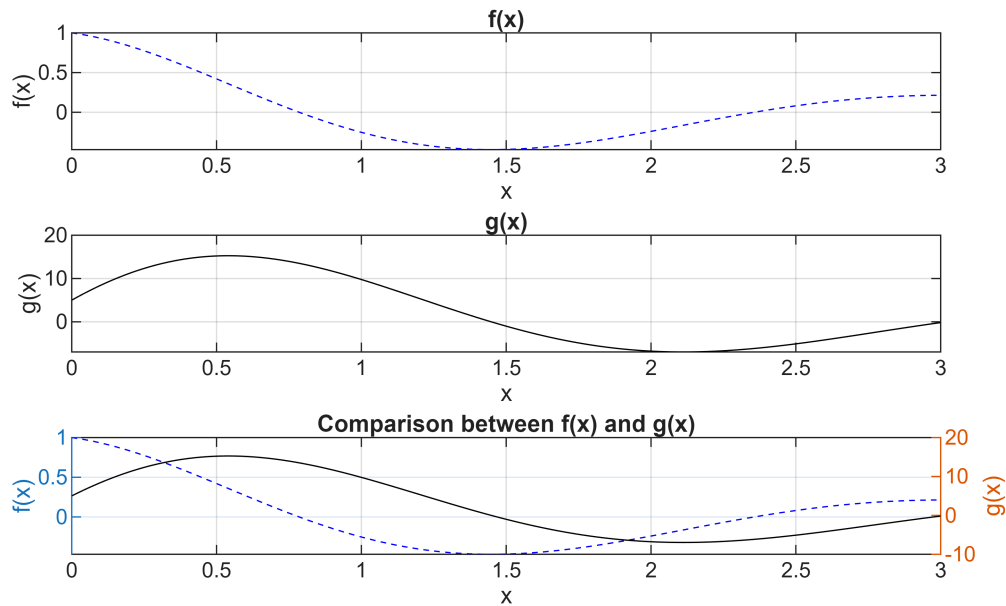
subplot(3,1,3)
yyaxis left
plot(x,f,'b--')
ylabel('f(x)')

yyaxis right

```

```
plot(x,g,'k')
ylabel('g(x)')
```

```
grid on
title('Comparison between f(x) and g(x)')
xlabel('x')
```



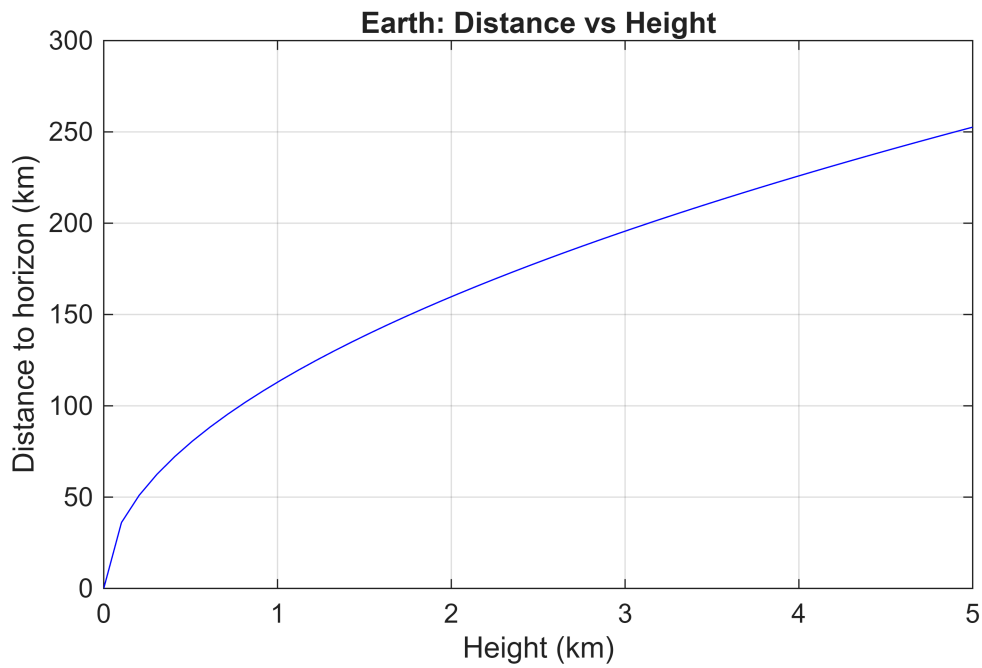
```
% Q3

% a)
clc; clear; close all;

rE=6377.85;
h = linspace(0,5,50);

dE = sqrt(2*rE.*h + h.^2);

figure;
plot(h, dE, 'b')
grid on
xlabel('Height (km)')
ylabel('Distance to horizon (km)')
title('Earth: Distance vs Height')
```



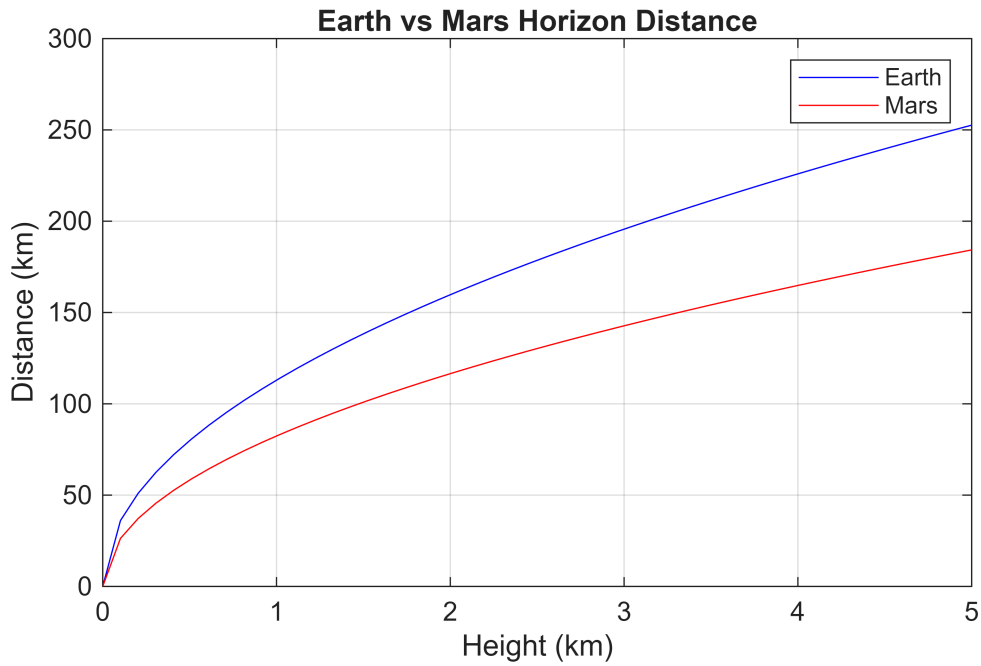
```

% b)
rM = 3393.31; % km

dM = sqrt(2*rM*h + h.^2);

figure;
plot(h, dE, 'b', h, dM, 'r')
grid on
legend('Earth','Mars')
xlabel('Height (km)')
ylabel('Distance (km)')
title('Earth vs Mars Horizon Distance')

```



% Q4

```

clc; clear; close all;

x = linspace(0.1,10,100); % avoid log(0)

y = x.^2;

figure;

subplot(2,2,1)
plot(x,y)
title('Linear-Linear')
grid on

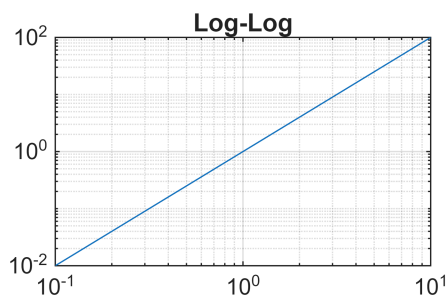
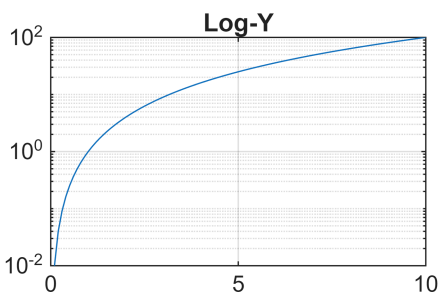
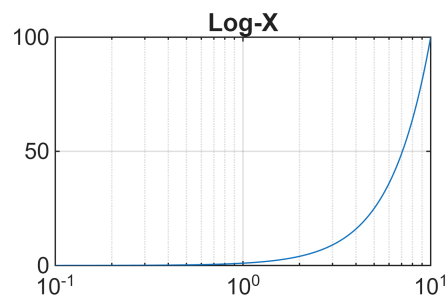
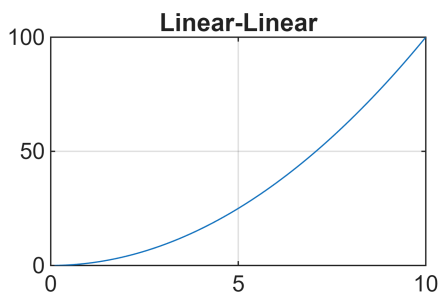
subplot(2,2,2)
semilogx(x,y)
title('Log-X')
grid on

subplot(2,2,3)
semilogy(x,y)
title('Log-Y')
grid on

subplot(2,2,4)
loglog(x,y)
title('Log-Log')

```

grid on



```
% Q5  
v0=50
```

```
v0 =  
    50
```

```
theta=45
```

```
theta =  
    45
```

```
g=9.81
```

```
g =  
    9.81
```

```
clc; clear; close all;
```

```
v0 = 50;  
theta = 45*pi/180;  
g = 9.81;
```

```
t_end = (2*v0*sin(theta))/g;  
t = linspace(0, t_end, 100);
```

```
h = v0*sin(theta)*t - 0.5*g*t.^2;  
v = sqrt((v0*cos(theta)).^2 + (v0*sin(theta)-g*t).^2);
```

```
% (a)  
figure;
```

```

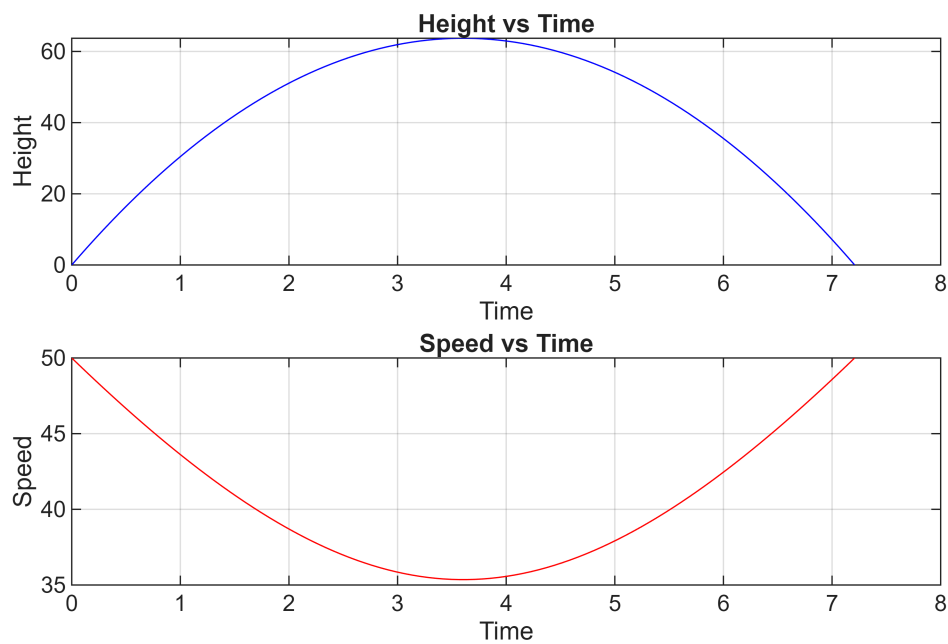
subplot(2,1,1)
plot(t,h,'b')
grid on
xlabel('Time'); ylabel('Height')
title('Height vs Time')

```

```

subplot(2,1,2)
plot(t,v,'r')
grid on
xlabel('Time'); ylabel('Speed')
title('Speed vs Time')

```



```

% (b)
figure;

yyaxis left
plot(t,h,'b')
ylabel('Height')

yyaxis right
plot(t,v,'r')
ylabel('Speed')

grid on
xlabel('Time')
title('Height & Speed vs Time')
legend('Height','Speed')

```

