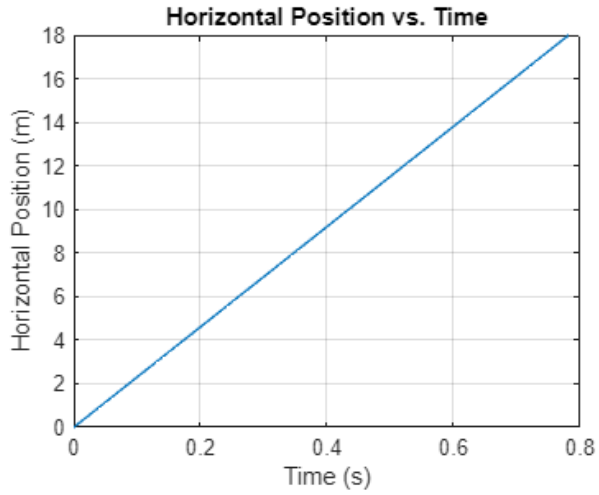
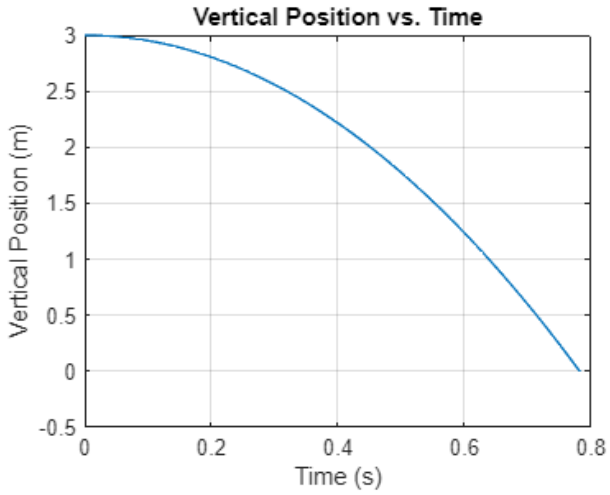
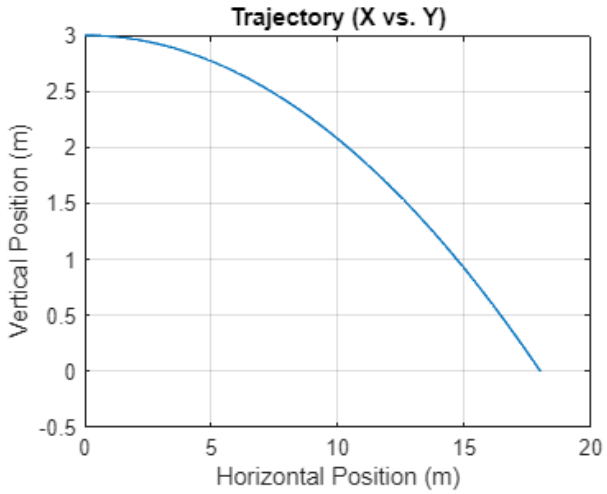
Solutions in Context

Problems A and D have no output

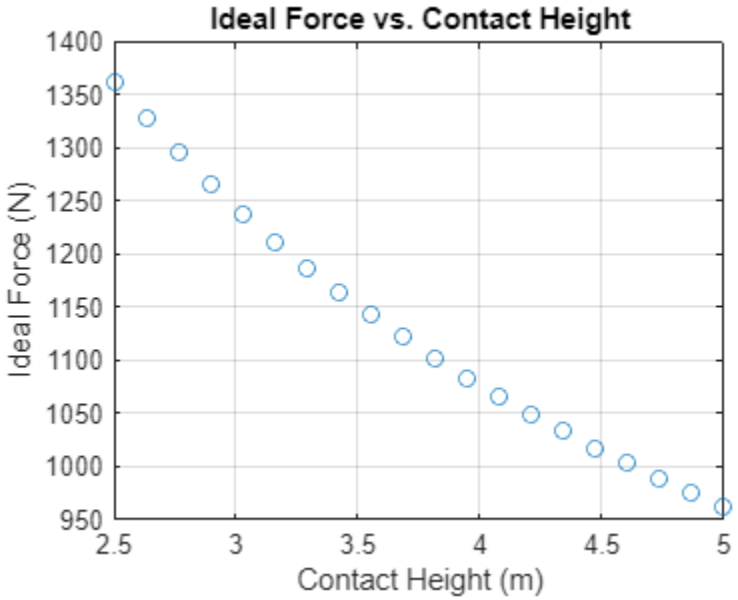
B:







C:



E:

```
For contact point 3.03 m, the ball does not clear the net.
Height at net: 2.26974 m, Net height: 2.43
```

```
For contact point 3.55 m, the ball clears the net.
Height at net: 2.66447 m, Net height: 2.43
```

Code

```
%Clean from past runs
clear
clc
close all
%parts
%A calculate x(t) and y(t)
%B plot x vs t y vs t and x vs y
%C Plot force needed vs jump height
%D Check if ball makes it over net or if jump height is insufecient


%PART A


%Field Dimensions & Fundamental Constants
x_final = 18;
x_naught = 0;
x_barrier = 9;
m_ball = 0.27;
```

```
g = 9.81;
ball_rad = 0.0207;
%Contact Position Desired
y_barrier = 2.43;
y_final = 0;
%Inputs (base values, will get vecotrised later)
jump_height = 3;
tc = 0.005;
%Write functions to use inputs to find further info


%Calculates y axis
%Rename Inputs to more useful/common kinematic names
h = jump_height;
y_naught = jump_height;
%Create time vector
tfinal = sqrt(2*h/g);
t = linspace(0,tfinal,(tfinal*100));
%Calculate y
y = y_naught - (g*t.^2)/2;


%Calculates x axis
v_x = (x_final - x_naught) / tfinal;
F = (v_x * m_ball) / tc;
x = x_naught +v_x*t;


%PART B


%Plot x vs t
plot(t, x);
xlabel('Time (s)');
ylabel('Horizontal Position (m)');
title('Horizontal Position vs. Time');
grid on;
%Plot y vs t
plot(t, y);  %  <--  Make sure 'y' is defined
xlabel('Time (s)');
ylabel('Vertical Position (m)');
title('Vertical Position vs. Time');
grid on;
%Plot x vs y
plot(x, y);
xlabel('Horizontal Position (m)');
ylabel('Vertical Position (m)');
title('Trajectory (X vs. Y)');
```

```
grid on;



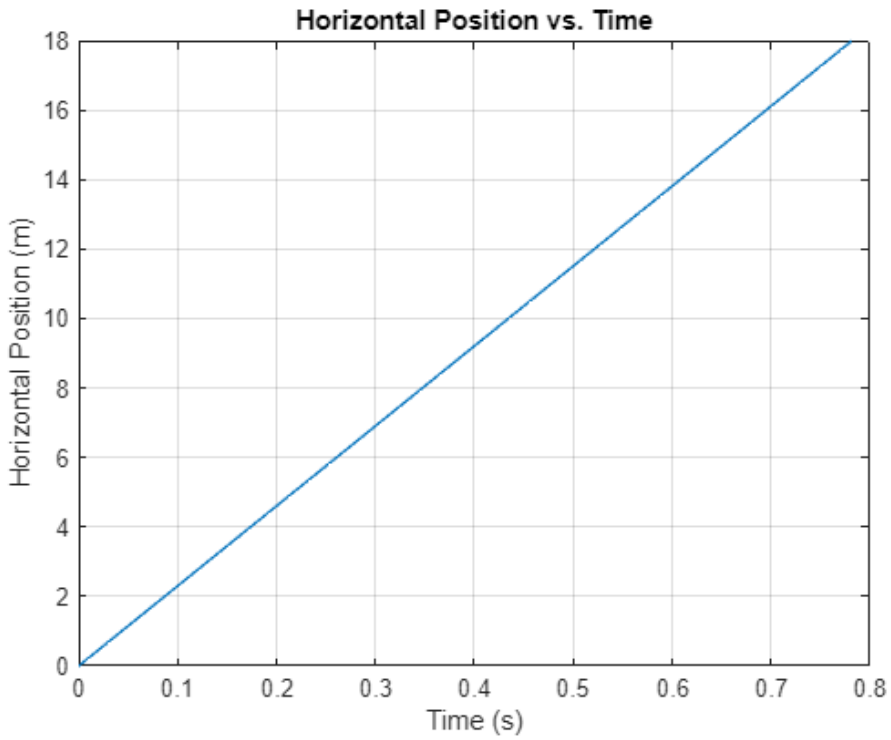

%PART C
F = (((x_final - x_naught) /(sqrt(2*jump_height/g))) * m_ball) / tc;
fprintf('The force your player needs to perform best is below\nOptimal Force= %g
Newtons',F)
%plotting
jump_heights = linspace(2.5,5,20);
F = ((x_final - x_naught) ./ sqrt(2 * jump_heights ./ g)) .* (m_ball ./ tc);
plot(jump_heights,F,'o')
xlabel('Contact Height (m)');
ylabel('Ideal Force (N)');
title('Ideal Force vs. Contact Height');
grid on;

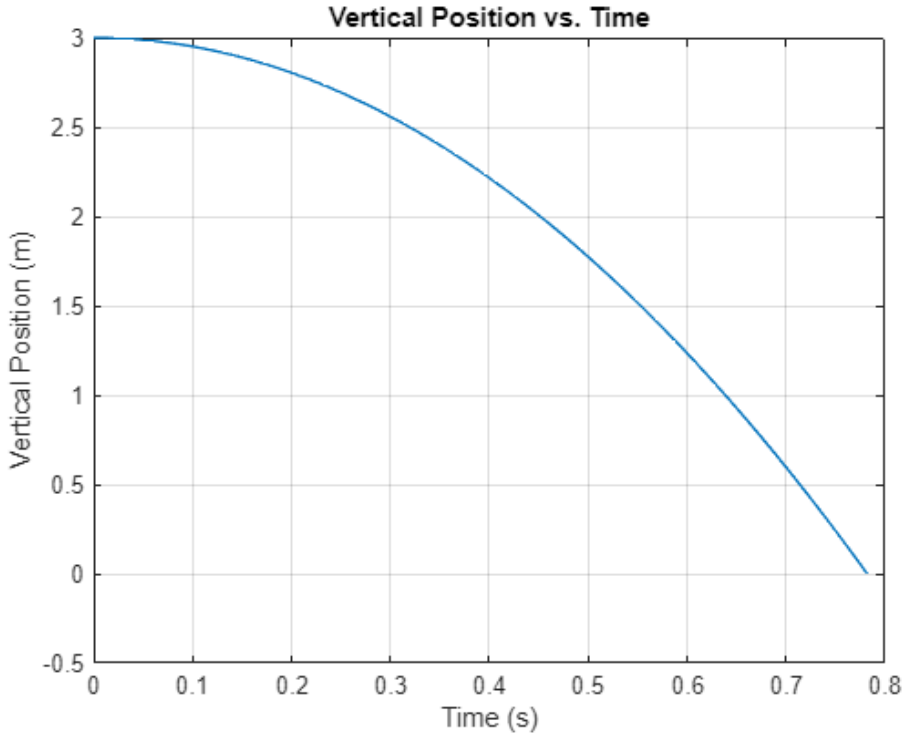

%PART D
%function[jumpheights,y_barrier]
ball_made_it = zeros(size(jump_heights));

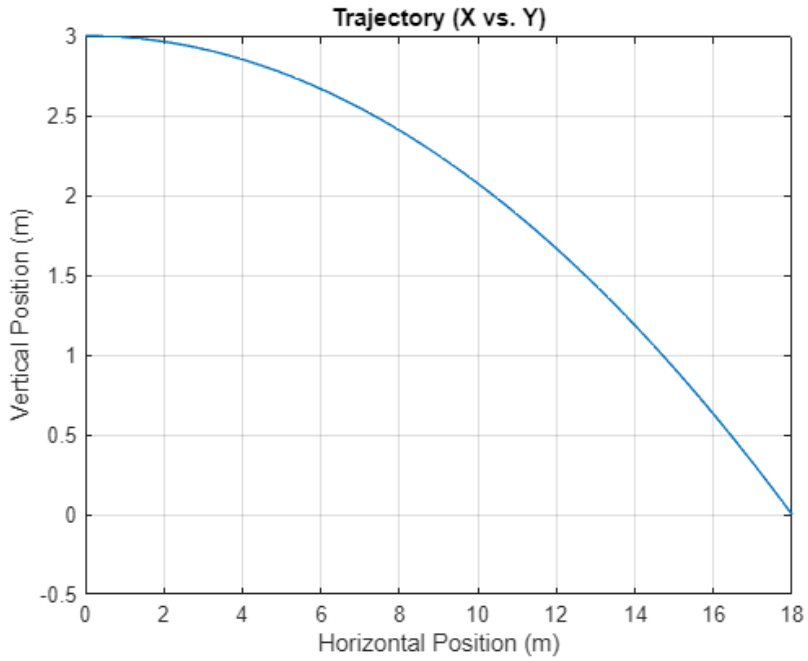

selected_index = input('Enter the index of the jump height you want to check (1-
20, or 0 for all): '); % Get user input


for i = 1:length(jump_heights)
    jump_height = jump_heights(i);
    t_final = sqrt(2 * jump_height / g);
    v_x = (x_final - x_naught) / t_final;
    time_barrier = (x_barrier - x_naught) / v_x;
    y_at_barrier = jump_height - (g * time_barrier^2) / 2;
    if y_at_barrier > y_barrier + ball_rad
        ball_made_it(i) = 1;
        if selected_index == i || selected_index == 0
            fprintf('For contact point %.2f m, the ball clears the net. \nHeight
at net: %g m, Net height: %g\n', jump_height, y_at_barrier,y_barrier);
        end
    else
        ball_made_it(i) = 0;
        if selected_index == i || selected_index == 0
            fprintf('For contact point %.2f m, the ball does not clear the net.
\nHeight at net: %g m, Net height: %g\n', jump_height, y_at_barrier, y_barrier);
        end
    end
end
```

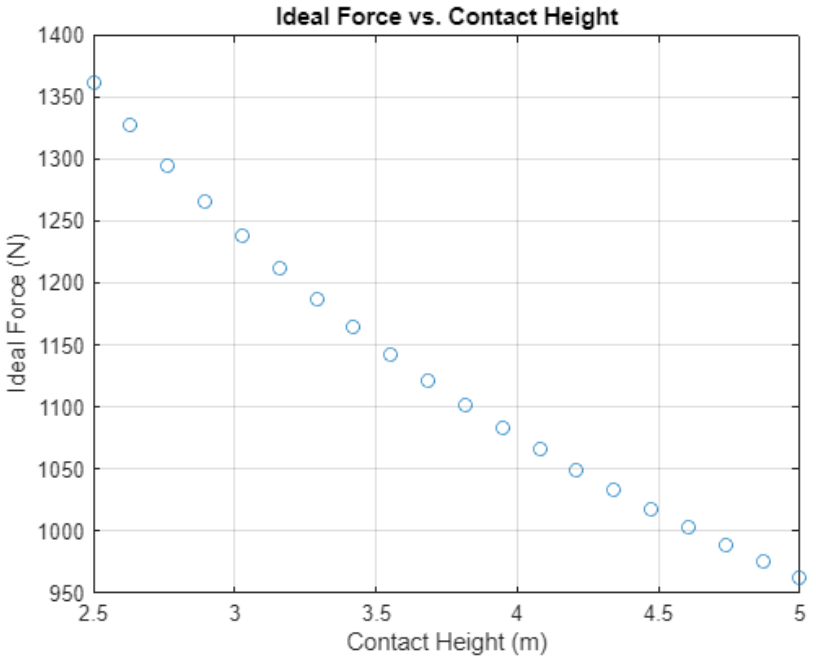
Command Window Outputs








```
The force your player needs to perform best is below
Optimal Force= 1242.87 Newtons
```




```
For contact point 3.03 m, the ball does not clear the net.
Height at net: 2.26974 m, Net height: 2.43
```

```
For contact point 3.55 m, the ball clears the net.
Height at net: 2.66447 m, Net height: 2.43
```