```
%Aidan Chin
%Project 2
%11/14/23


% initialize

clear
clc

% Constants

g = 32.2; % acceleration of gravity in ft/s^2
theta = deg2rad(28); % launch angle in radians
vE = 116 * 5280 / 3600; % exit velocity in ft/s (converted from mph)
aToF = 5.3; % time of flight in seconds
baseballmass = 0.145; % mass of a baseball in kg

% Initial conditions
x0 = 0; y0 = 0; % initial position
vx0 = vE * cos(theta); % initial x-component of velocity
vy0 = vE * sin(theta); % initial y-component of velocity

% Time settings
dt = 0.01; % time step
tmax = aToF; % maximum time
tval = 0:dt:tmax; % array of time values

% Initialize arrays to store results
x = zeros(size(tval));
y = zeros(size(tval));

% Initial conditions
x(1) = x0;
y(1) = y0;
vx = vx0;
vy = vy0;

% Checking functions
check_x = abs(x(end) - (vx0 * tval(end)))
check_y = abs(y(end) - (y0 + vy0 * tval(end) - 0.5 * g * tval(end)^2))

% Numerical computation using Euler's method
for i = 2:length(tval)
    % Acceleration components
    ax = 0; % no acceleration in x-direction
    ay = -g; % acceleration due to gravity in y-direction

    % Update velocities and positions using Euler's method
    vx = vx + ax * dt;
    vy = vy + ay * dt;
```

```
52      x(i) = x(i - 1) + vx * dt;
53      y(i) = y(i - 1) + vy * dt;
54
55      % Check for the end of the trajectory
56      if y(i) < 0
57          break;
58      end
59  end
60
61  % Plot trajectories
62  figure;
63  plot(vx0 * tval, y0 + vy0 * tval - 0.5 * g * tval.^2, '--', ...
64      'LineWidth', 1.5, 'DisplayName', 'Analytic');
65  hold on;
66  plot(x, y, '-', 'LineWidth', 1.5, 'DisplayName', 'Numeric');
67  title(['Aidan Chin | ECE202 Project 2 | 12/07/23 |' ...
68      ' Baseball Trajectory without Air Resistance']);
69  xlabel('Distance (feet)');
70  ylabel('Height (feet)');
71  legend('Location', 'Best');
72  ylim([-20, 100]); % Adjusted based on your specifications
73  grid on;
74
```

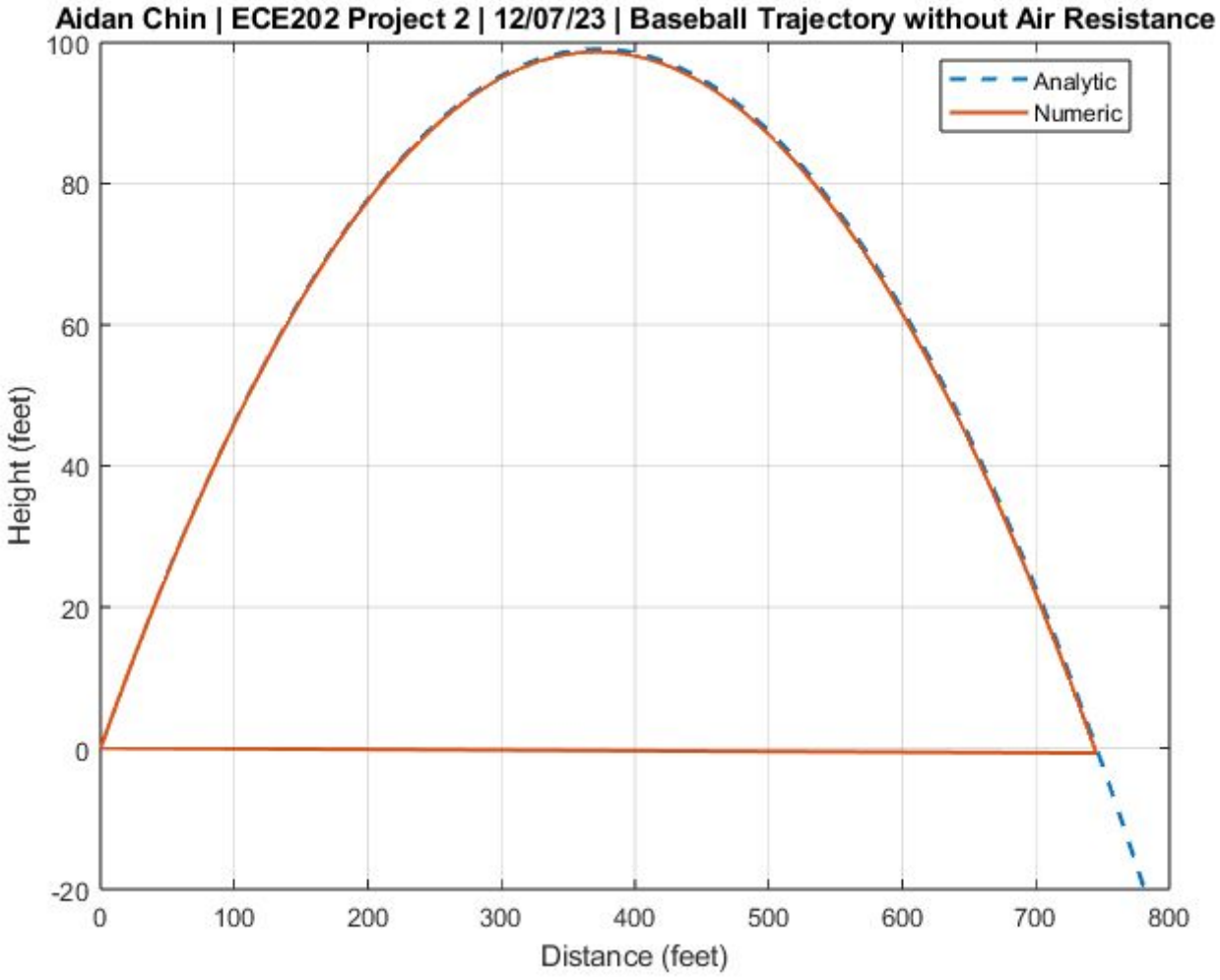
```
check_x =

  796.1597


check_y =

   28.9234

>>
```


Aidan Chin | ECE202 Project 2 | 12/07/23 | Baseball Trajectory without Air Resistance
Analytic
Numeric
Height (feet)
Distance (feet)
100
80
60
40
20
0
-20
0
100
200
300
400
500
600
700
800