Yogesh Mundhra

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Group 4
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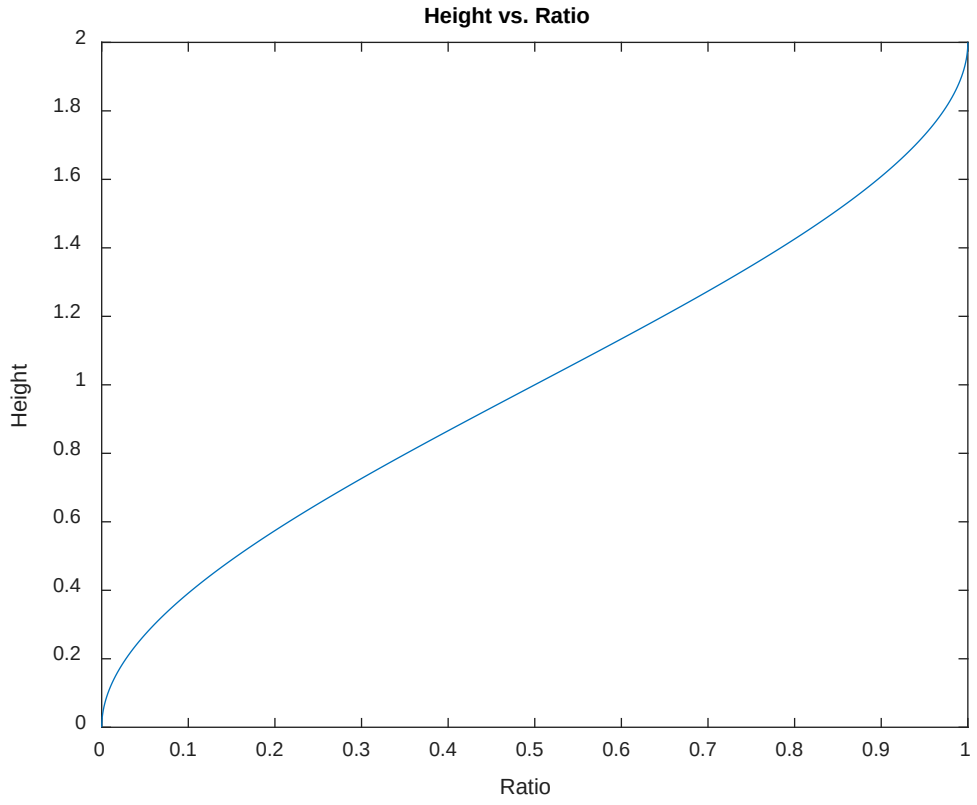
Assignment 3

1)




```
Enter the radius of the sphere in (mm): 40
Enter the average density of the sphere in (g/mm): 0.6
Enter the density of the liquid in (g/mm): 1.0
The sphere depth below the fluid surface is 45.300000>>
```

The ratio was calculated using algebraic manipulation of the equations.

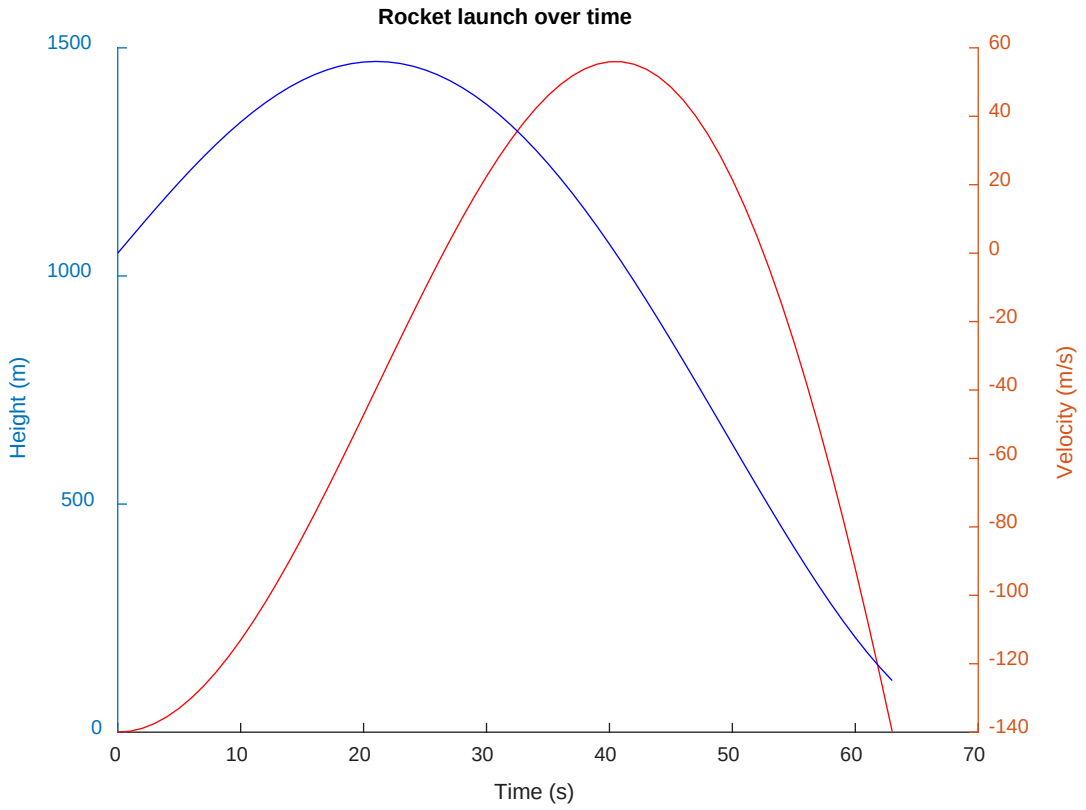
A small density means a a small h/r ratio.

```
function [] =Q1_2()
h=0:0.01:3;
ratio = ((3.*h. ^2)-(h.^3))./4;
plot(ratio,h)
```

```
title('Height vs. Ratio')
xlabel('Ratio')
ylabel('Height')
end

function [] = Q1()
r = input('Enter the radius of the sphere in (mm): ');
ps = input('Enter the average density of the sphere in (g/mm): ');
p0= input('Enter the density of the liquid in (g/mm): ');
h=0:0.1:2*r;
volsphere=(4/3)*pi*r^3;
masssphere=volsphere*ps;
volfluid=(pi/3)*((3*r.*h.^2)-(h.^3));
massfluid=volfluid*p0;
y=masssphere-massfluid;
for i=1:500
    if y(i)*y(i+1)<0
        fprintf('The sphere depth below the fluid surface is %f', h(i))
    end
end
end
```

2)

```
%Calculates the height and velocity.
%Yogesh Mundhra
%Group 4
%Assignment 3 ENSC 180
function [height, velocity] = R_motion(time)
height = 2.13.*time.^2-0.0013.*time.^4+0.000034.*time.^4.751;
velocity = 2*2.13.*time - 4*0.0013.*time.^(3) +
4.751*0.000034.*time.^(3.751);
end
```

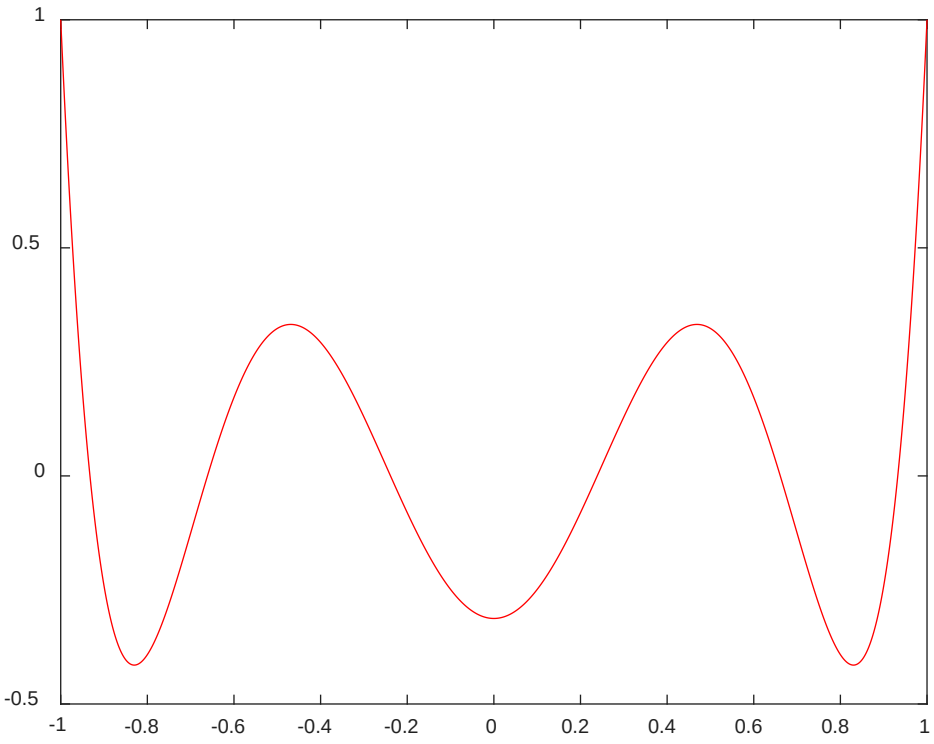



```
%Plots two graphs separately of time vs height and speed vs height
%Yogesh Mundhra
%Group 4
%Assignment 3 ENSC 180
function R_motionplot(f,time)
height = length(time);
velocity = length(time);
[height,velocity] =f(time);
hold on
yyaxis left
plot(time, height, 'r')
xlabel('Time (s)');
ylabel('Height (m)');
yyaxis right
plot(time, velocity, 'b')
title('Rocket launch over time');
ylabel('Velocity (m/s)');
hold off
end
```

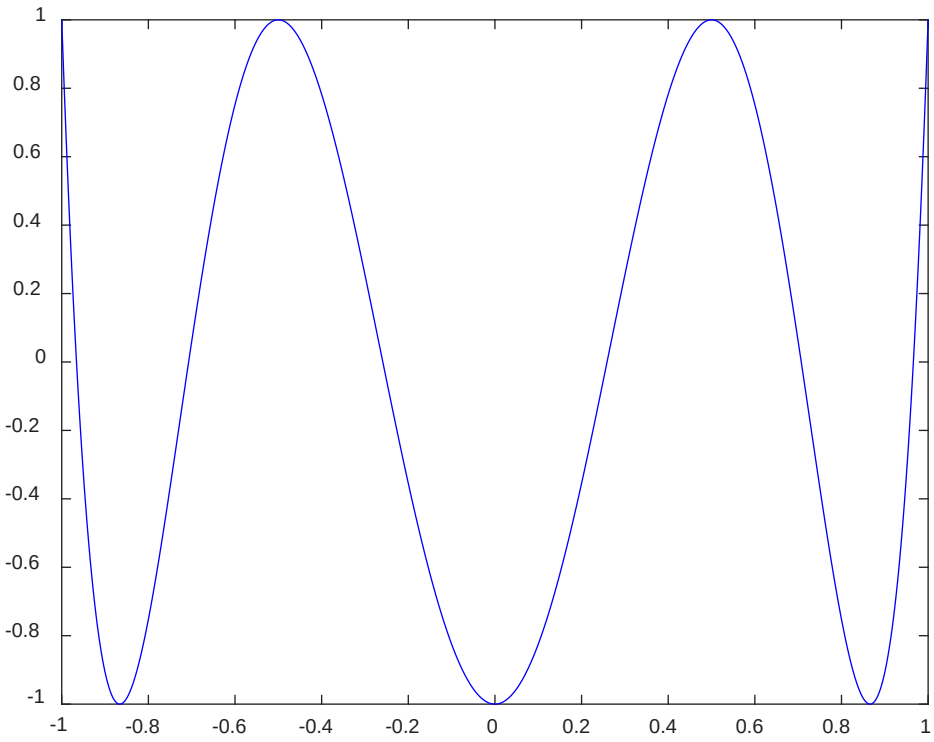
The velocity (actually speed) is the derivative of the height function.

3)**The roots are symmetrical (approximate to 0.001) and the degree of the polynomial is the number of roots as well.**

```
>> Q3

The root #1 for the Legendre polynomial is -0.932

The root #2 for the Legendre polynomial is -0.661

The root #3 for the Legendre polynomial is -0.238

The root #4 for the Legendre polynomial is 0.239

The root #5 for the Legendre polynomial is 0.662

The root #6 for the Legendre polynomial is 0.933

The root #1 for the Chebyshev polynomial is -0.965

The root #2 for the Chebyshev polynomial is -0.707

The root #3 for the Chebyshev polynomial is -0.258

The root #4 for the Chebyshev polynomial is 0.259

The root #5 for the Chebyshev polynomial is 0.708

The root #6 for the Chebyshev polynomial is 0.966
```



Legendre polynomial



Chebyshev Polynomial graph.

4) Could not understand how to do the question at all. I need help with it.