

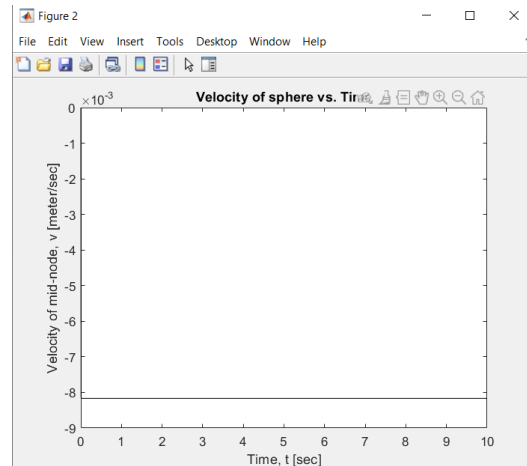
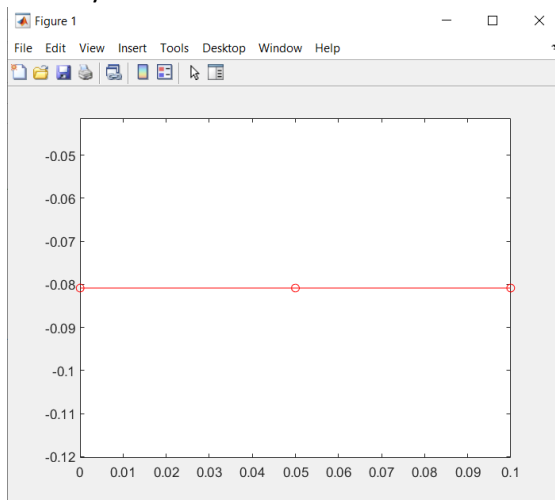
MAE 259B HW1

JIAHUI XI

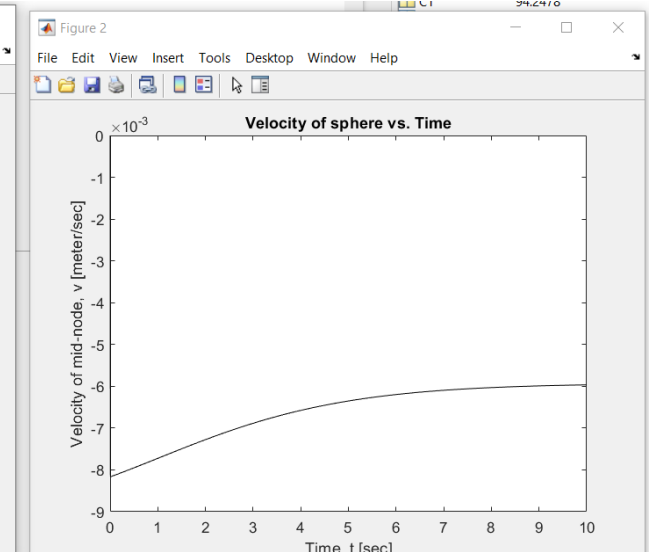
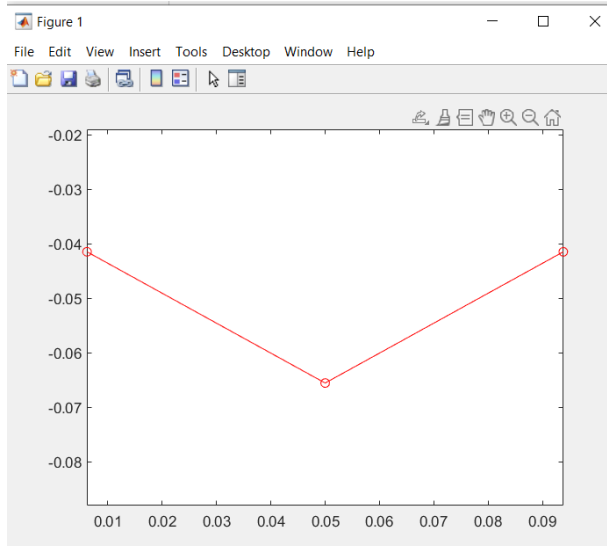
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Problem 1: Section 4.2

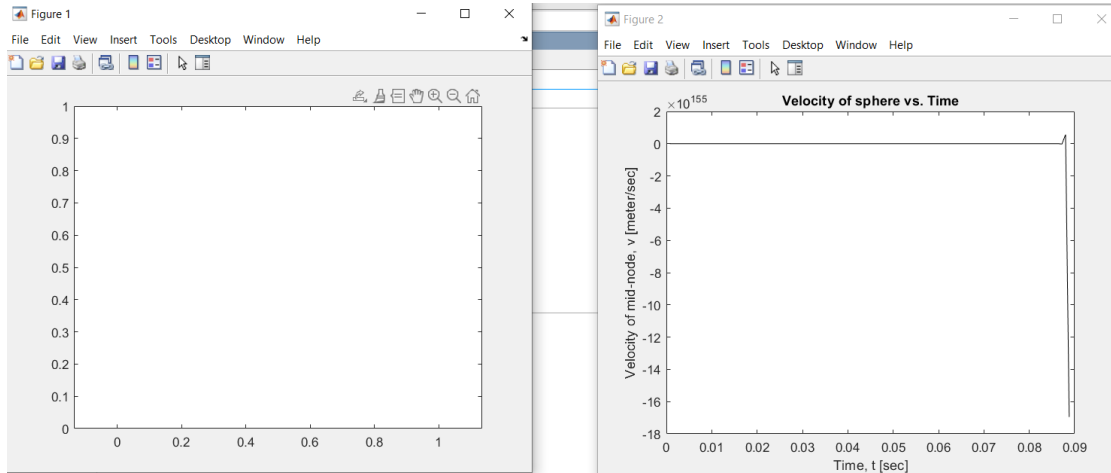
1. When $R1 = R2 = R3$, the three ball will drop uniformly in the viscous fluid. The turning angle will be equal to zero. The velocity line will be horizontal. (As shown below); the simulation agrees with my intuition.



2. Originally, when I used the step size close to $1e-5$ for explicit method. It gives almost same answer as implicit method as the following shown.



When I decrease the step size to $1e-3$, the implicit method is just slower to simulate the sphere drop case. However, when I increase the step size for explicit method to $8e-4$, it cannot the simulate the case because explicit method for solving large step size will deviate from its true value

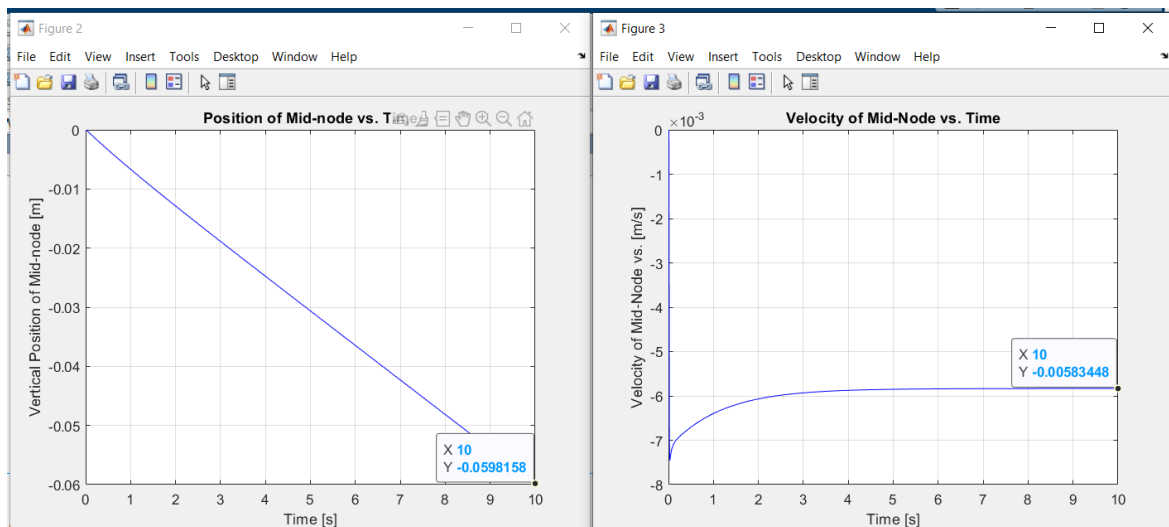


Problem 2: Section 4.3

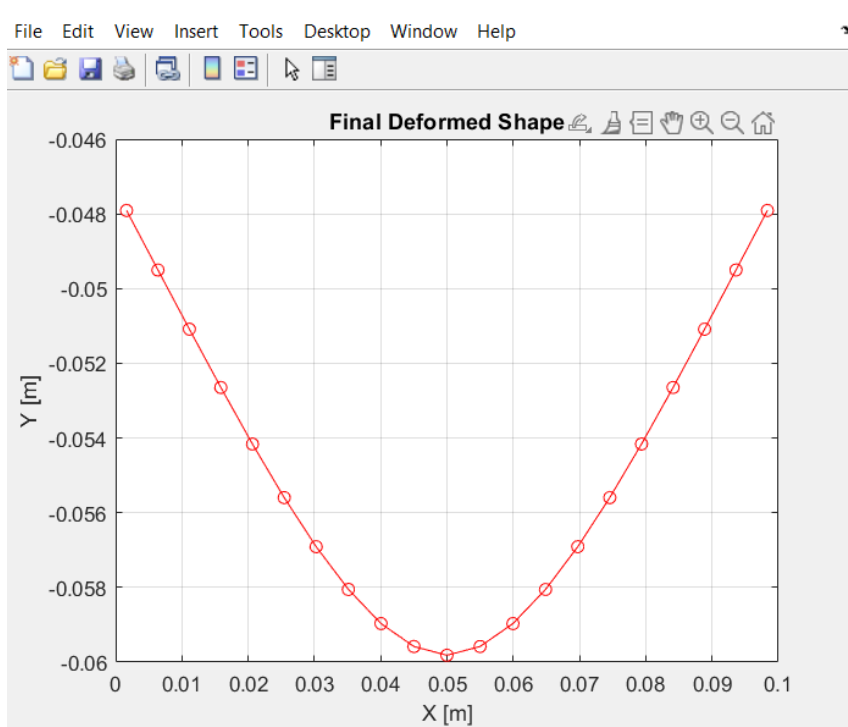
1. The vertical position and velocity of the middle node with time

Terminal Position = -0.0598 [m]

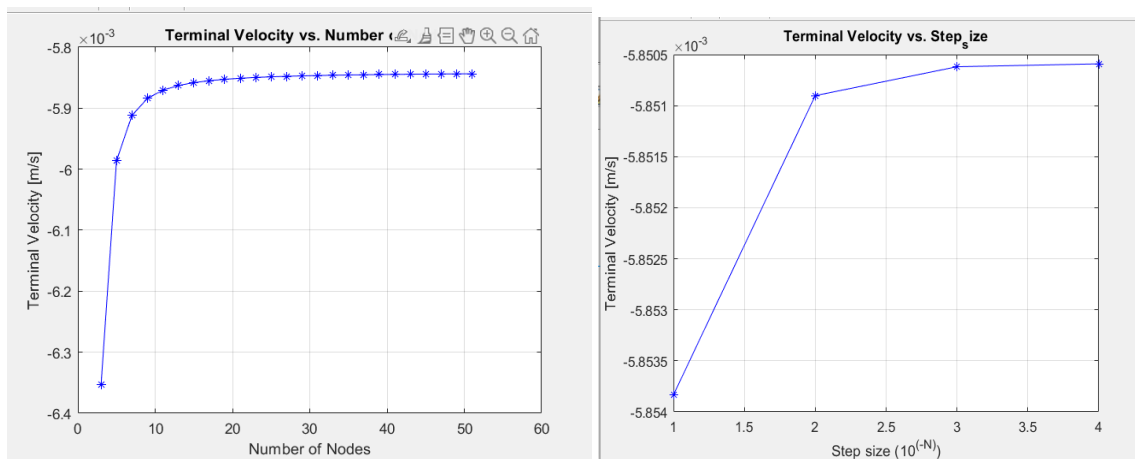
Terminal Velocity = -0.05834×10^{-3} [m/s]



2. the final deformed shape of the beam



3. plots of terminal velocity vs. the number of nodes & terminal velocity vs. the time step size.

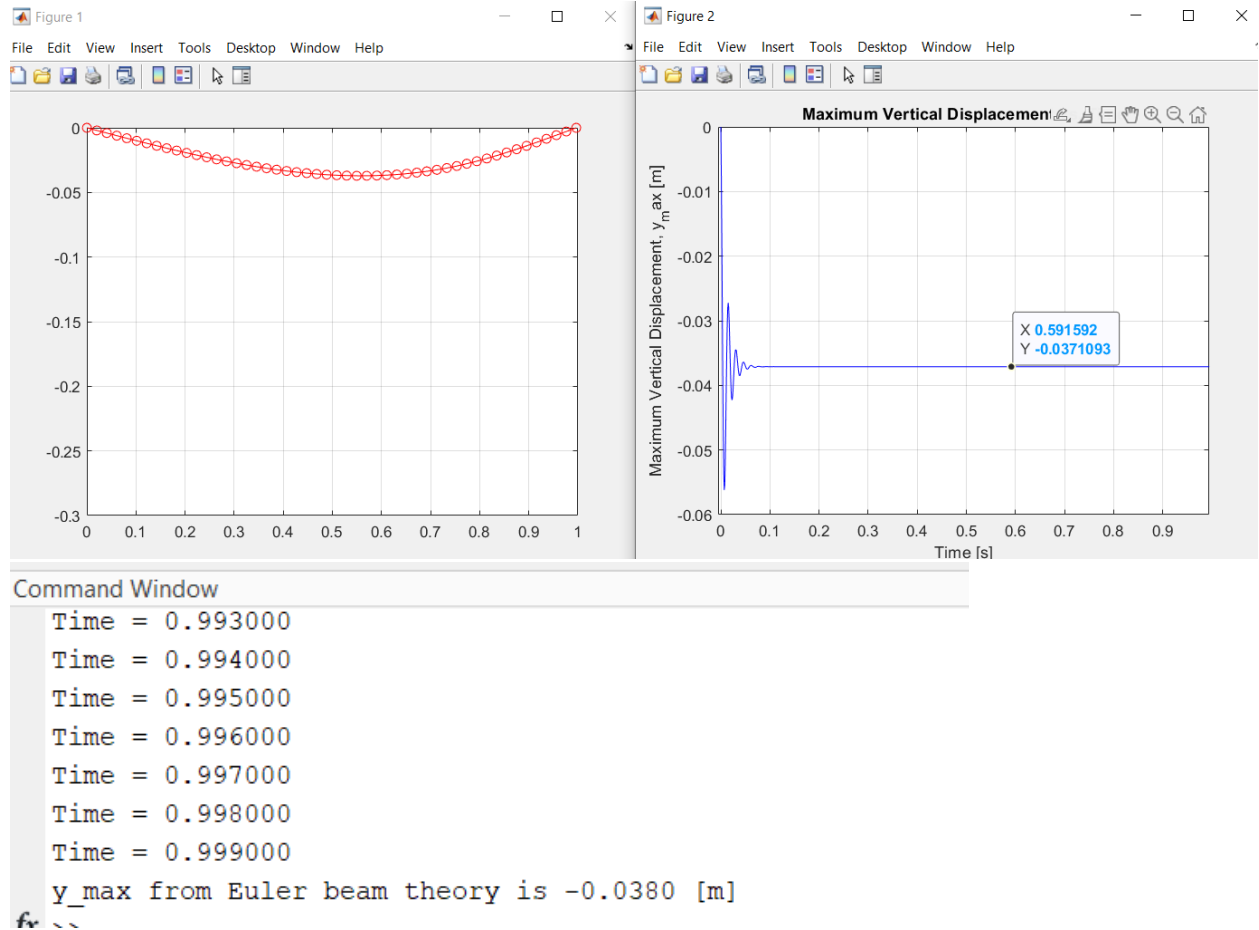


As we can see, the terminal velocity almost keeps the same as number nodes or time step length changes

Problem 3: Section 4.4

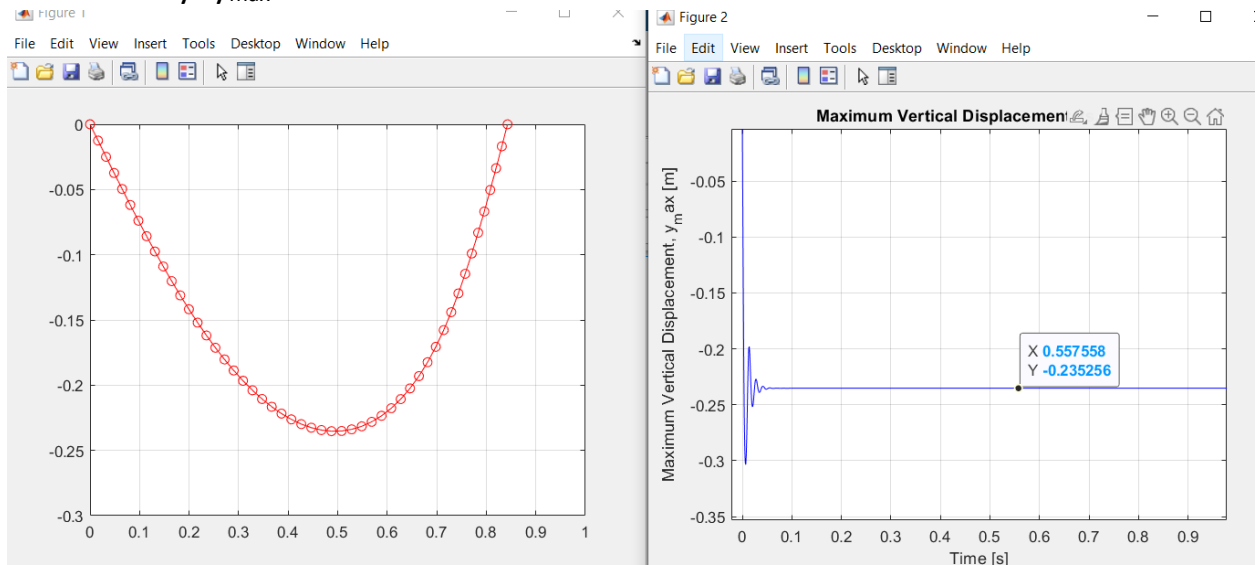
1. When $p = 2000\text{N}$, $y_{\max} = -0.0371\text{m}$ (as shown)

Euler theory: $y_{\max} = -0.0380\text{m}$



2. When $p = 20000\text{N}$, $y_{\max} = -0.02352\text{m}$ (as shown)

Euler theory: $y_{\max} = -0.03804\text{m}$



```
104      diff = abs(max_disp - y_euler);  
Command Window  
Time = 0.993000  
Time = 0.994000  
Time = 0.995000  
Time = 0.996000  
Time = 0.997000  
Time = 0.998000  
Time = 0.999000  
y_max from Euler beam theory is -0.3804 [m]
```