

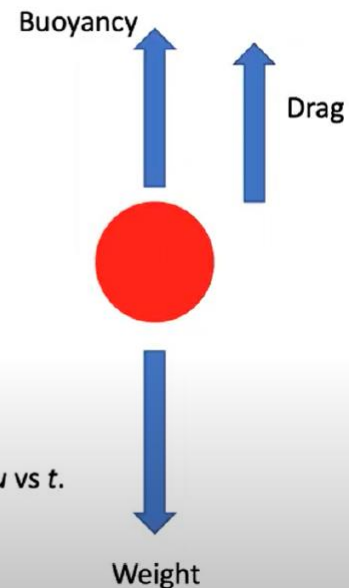
## Assignment 1

$$m \frac{du}{dt} = W - F_B - F_D$$

$$m \frac{du}{dt} = mg - V\rho g - 6\pi R\eta u$$

### EXERCISE:

- ☐ Fix the properties of the fluid and solid sphere.
- ☐ Do you get a terminal velocity? What will be the analytical expression for the same?
- ☐ Get the analytical answer for  $u$  vs  $t$  (assume  $u = 0$  at  $t = 0$ )
- ☐ For the same initial velocity, numerically compute  $u$  vs  $t$ .
- ☐ Compare the analytical and numerical answers on a plot of  $u$  vs  $t$ .
  - ☐ Analytical – solid line; numerical – dashed line



### Instructions for Assignment 1

- Submit the MATLAB Code file and Report in a ZIP file with “RollNumber\_Name.zip” to [devangk20@iitk.ac.in](mailto:devangk20@iitk.ac.in) with Subject as “**Assignment 1 by <RollNumber> <Name> Hand on MATLAB**”
- The report should consist of the relevant graphs and calculations shown.
- Take the value of the required properties as follows:
  - Radius of sphere =  $10^{-5}$  m
  - Density of liquid =  $1000 \text{ kg/m}^3$
  - Density of sphere =  $8050 \text{ kg/m}^3$
  - Viscosity of liquid =  $10^{-3} \text{ Pa.s}$
  - Acceleration due to gravity =  $9.8 \text{ m/s}^2$

The deadline for submission is 11 Feb 2023, 11:59 pm