# Assignment I

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ENE 382: Engineering mathematics IV

A Plate (fat) of mass is falling freely in air with velocity V is subjected to a down and gravitation force and an Upward Frictional drag force due to air. If the drag force, $f_D$ is given by equ (1)

$$f_D = \frac{0.3V^2}{500 + (1+V)^3} - 0.02V \quad \text{—(1)}$$

and the terminal Velocity is reached then the drag force equals the gravitational force, that is $F_D = mg$ (2) taking the Values of m and g to be 3.5kg and 9.8m/s² respectively. Using a guess Value of $V_0 = 0.5$ m/s { employs Fixed-Point Iteration method, develop a MATLAB Program to estimate the terminal method develop a MATLAB Program to estimate the terminal Velocity. Take the absolute Percentage relative error tolerance to be less than or equal to 1E-11

Sol

$$F_D = \frac{0.3V^2}{500 + (1+V)^3} - 0.02V \quad \text{—(1)}$$

$F_D = mg = 3.5 \times 9.8 = 34.3$ —(2)

equating equ 1 & 2

$$mg = 34.3 = \frac{0.3V^2}{500 + (1+V)^3} - 0.02V$$

making $V^2$ Subject of formula

$$34.3 + 0.02V = \frac{0.3V^2}{500 + (1+V)^3}$$

$0.3V^2 = (34.3 + 0.02V) \times (500 + (\ln V)^5)$

$V^2 = \left((34.3 + 0.02V) \times (300 + (\ln V)^3)\right)^{1/0.3}$

$V = \sqrt{\left((34.3 + 0.02V) \times (500 + (\ln V)^3)\right)^{1/0.3}}$

Initial guess value $\Rightarrow V_0 = 0.5\ m/s$ Absolute & relative error, $\varepsilon_a(i+1) \leq 1E-11$