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Ass 1

A plate (flat) of mass m falling freely in air with velocity v, is subjected to a downward gravitational force and an upward frictional drag due to air. If the drag force, f_o is given by eqn (1).

$$f_o = \frac{0.3\,v^2}{500 + [\ln v]^3}$$

and the terminal velocity is reached when the drag force equals the gravitational force equals the gravitational force, that is

$f_o = mg$ --- 2

Taking the values of m and g to be 3.5 kg and 9.8 m/s² respectively, using a guess value of $v_r = 0.5$ m/s, employing fixed point Iteration method, developed matlab program to estimate the terminal velocity. Take the absolute percentage relative error tolerance to be less than or equal to 1E-11.

Soln

$$f_o = \frac{0.3v^2}{500 + [\ln v]^3} \quad \text{——} \quad 0.02v \quad \text{---} (1)$$

$f_o = mg = 3.5 \times 9.8 = 34.3$

$$mg = 34.3 = \frac{0.3v^2}{500 + [\ln v]^3} = 0.02v$$

making v^2 subject of formular.

$$34.3 + 0.02v = \frac{0.3v^2}{500 + [\ln v]^3}$$

$$0.3v^2 = \frac{[(34.3 + 0.02v) * (500 + [\ln v]^3)]}{0.3}$$

$$V = \sqrt{\frac{[(34.3 + 0.02V) \times (800 + [\ln V]^3)]}{1} \times 10/3}$$