Mains Assignment 1

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Soln

$$F_D = \frac{0.3v^2}{500+(\ln v)^3} - 0.02v$$

$F_D = mg$

Terminal velocity is reached when the drag force = gravitational force.

$m = 3.5,\ g = 9.8 m/s^2$

$\Rightarrow F_D = mg = 3.5 \times 9.8 = 34.3$

Equating F_D in eqn (1) and (2)

$$F_D = \frac{0.3v^2}{500+(\ln v)^3} - 0.02v = 34.3$$

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

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

$$0.3v^2 = (34.3 + 0.02v)(500+(\ln v)^3)$$

Making v^2 subject of formular

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

$$v_{i+1} = \sqrt{\frac{(34.3+0.02v)(500+(\ln v)^3)}{0.3}}$$

$v = 0.5$

$$v_{i+1} = \sqrt{\frac{[(34.3+0.02(0.5)][500+(\ln(0.5)^3]}{0.3}}$$

$= 304.0675323 m/s$