SANNI OLUWATEFISIMI O.
MECHATRONICS ENGINEERING
16/ENG05/1030
ENGINEERING MATHEMATICS IV

Assignment 1 Solution.

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

rearranging

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

given

$m = 3.5kg$ and $g = 9.8$

$$F(v) = 3.5 \times 9.8 = \frac{0.3v^2}{500+(\ln v)^3} - 0.02v$$

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

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

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

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

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

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

$$g(v) = v = e^{\sqrt[3]{\frac{0.3v^2}{34.3+0.02v} - 500}}$$

MATLAB

```
Command Window
Clear all
clc
Syms v
v = 0.5
for all i = 1:
        iter(i+1) = i
        v(i+1) = exp((((0.3*v^2)/(3+.3+0.02^v))-500)^(1/3)
        Ea(i+1) = abs((v(i+1)-v(i))/v(i+1))-100
        if Ea(i+1) <= 1E-11
            break
        end
end
table = [iter' v' Ea']
```

Estimated terminal velocity is 30H.7m/s