

# ASSIGNMENT 1: STOKES' LAW USING PYTHON

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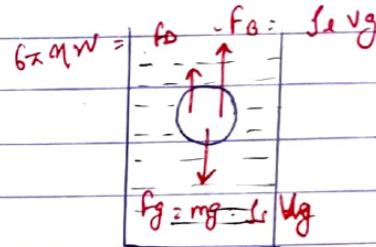
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## Stoke's Law

Drag force =  $F_d = 6\pi\eta r v$

$$F_{net} = F_g - F_b - F_d$$

$$m \frac{dw}{dt} = (f_s - f_l) V g - 6\pi\eta r v$$



$$\frac{dw}{dt} = \frac{(f_s - f_l) V g}{f_s V} - \frac{6\pi\eta r v}{f_s V} \rightarrow \text{velocity}$$

$$= \frac{(f_s - f_l) g}{f_s} - \frac{6\pi\eta r v}{f_s V}$$

$$\frac{dw}{dt} = \frac{(f_s - f_l) g}{f_s} - \frac{9}{2} \frac{\eta v}{f_s r^2} \rightarrow \text{Solve this ODE in python}$$

Initial value:  $v(t=0) = 0$

(Starts from rest)

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▶ error=0; tol = 10**(-10)
g=9.81
del_t = 0.01
v_p = 0
vis, r, den_s, den_l = [float(x) for x in input().split()]
error=100
while(error > tol):
    a = ((den_s-den_l)*(9.81))/den_s - (4.5*vis*v_p)/(den_s*r*r)
    v_n = v_p + a*del_t
    error = (v_n - v_p)/v_n
    v_p = v_n
print("Terminal velocity from iterations: ",v_n)
print("Terminal Velocity as calculated from formula:", (2*r*r*g*(den_s-den_l))/(9*vis))
    
```

2.18 0.05 8050 1000

Terminal velocity from iterations: 17.624999640729037

Terminal Velocity as calculated from formula: 17.625000000000004