ENG272 Exam #1, Fall 2015

force of air resistance

$R_a \propto \sqrt{(v)^3}$ or $R_a = k \cdot \sqrt{(V_{inst})^3}$

Constant of proportionality

2. Determine a differential equation for the velocity $v(t)$ of a falling body of mass m if air resistance is proportional to the square root of the cube of the instantaneous velocity. Do not solve.

$$\boxed{\sum F = ma}, \quad \boxed{mg - R_a = ma = m \cdot \frac{d^2s}{dt^2}}$$

$V(t) = \frac{ds}{dt}$

$$9.8m - k \cdot \sqrt{(V(t))^3} = m\frac{d^2s}{dt^2}$$

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$$k \cdot \sqrt{(V(t))^3} = m \cdot \frac{d^2s}{dt^2} - 9.8 \cdot m$$

$$\sqrt{(V(t))^3} = \frac{m}{k} \cdot \frac{d^2s}{dt^2} - 9.8\frac{m}{k}$$

$$(V(t))^3 = \left(\frac{m}{k} \cdot \frac{d^2s}{dt^2} - 9.8\frac{m}{k}\right)^2$$

$$\boxed{V(t) = \sqrt[3]{\left(\frac{m}{k}\frac{d^2s}{dt^2} - 9.8\frac{m}{k}\right)^2}}$$

You need an ODE

OK But

$\frac{dv}{dt} =$

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