

2.3: Modeling Diff. Eq

Famous (Common) Questions :-

▪ Newton's law of cooling :-

$$\frac{du}{dt} = -k(u-T)$$

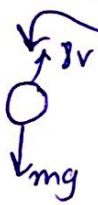
$$\frac{du}{u-T} = -dt k$$

$$\ln(u-T) = -kt + C$$

$$u-T = e^{-kt} C$$

$$u = e^{-kt} C + T$$

▪ Falling object or thrown object



$$ma = mg - \gamma v$$

$$\frac{dv}{dt} = g - \frac{\gamma v}{m}$$

$$\frac{dv}{g - \frac{\gamma v}{m}} = g dt$$

$$-\frac{\gamma}{m} \ln(g - \frac{\gamma v}{m}) = gt + C$$

$$g - \frac{\gamma v}{m} = \left(\frac{-\gamma t m}{e} \right) + C$$

$$-\frac{\gamma v}{m} = e^{\frac{-\gamma t m}{e}} + e^C - g \rightarrow \text{Constants}$$

$$v = \left(\frac{m}{\gamma} \right) e^{\frac{-\gamma t m}{e}} C + \left[\frac{g m}{\gamma} \right]$$



$$ma = \gamma v - mg$$

$$\frac{dv}{dt} = \frac{\gamma v}{m} - g$$

The rest is the same

Concentration

$\frac{dQ}{dt} = \text{flow in} - \text{flow out}$] should be in Salt (material)/min

$\frac{dQ}{dt}$ (or kg...) \leftarrow g
min (or s or h) \leftarrow rate of flow in

usually same rate of flowing in multiplied with Concentration

- Use Units to Specify your Equation