(initial) rate $= k[A]_0^m$ differential

$\frac{\Delta[\ ]}{\Delta \text{time}}$

k: units depend on m & n

m: 0, 1, 2, 3

$A \rightarrow$ products

→ simple rxn

integrated rate law

1st order → $\ln\left(\frac{[A]_t}{[A]_0}\right) = -kt$

2nd order $\ln[A]_t = -kt + \ln[A]_0$

$$\frac{1}{[A]_t} - \frac{1}{[A]_0} = kt$$

$$\frac{1}{[A]_t} = kt + \frac{1}{[A]_0}$$

0. order

[A] vs time

half-life

1st order

$[A]_{t_{1/2}} = 0.5[A]_0$

$$\ln\left(\frac{.5[A]_0}{[A]_0}\right) = -kt$$

$$\ln(.5) = -k t_{1/2}$$

$$-0.693 = -k t_{\frac{1}{2}}$$

$$t_{\frac{1}{2}} = \frac{.693}{k}$$

2nd order

$$\frac{1}{.5[A]_0} - \frac{1}{[A]_0} = kt$$

$$\frac{2}{[A]_0} - \frac{1}{[A]_0} = kt$$

$$\frac{1}{[A]_0} = k t_{\frac{1}{2}}$$

$$t_{\frac{1}{2}} = \frac{1}{k[A]_0}$$