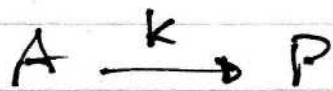


1st order



$$-\frac{d[A]}{dt} = k[A]$$

Here is your DERIVED rate law that we need to integrate

$$+\frac{d[A]}{[A]} = -k dt$$

Since we want the derivative in respect to $[A]$ switch the side of $[A]$ + dt . Also switch the signs

$$\int_{[A]_0}^{[A]} \frac{d[A]}{[A]} = \int_0^t -k dt$$

Since we are integrating w/ respect to t k is a constant so it can pop outside the integral so all you have is $\int_0^t dt = t/0$

Now to integrate finding the integral of both sides from initial values to the end points $[A]_0$

$$\rightarrow \int \frac{1}{x} dx = \ln x$$

$$\ln [A] \Big|_{[A]_0}^{[A]} = -kt \Big|_0^t$$

Now plug in initial + final values

($t=0$ makes $kt=0$)

$$\ln [A] - \ln [A]_0 = -kt$$

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

Properties of logs
→ Subtracting by same log base can be changed to dividing the logs as one

Comes from using def. of logs + rewriting previous line

$$\begin{aligned} \rightarrow \ln \frac{a}{b} &= x \\ \rightarrow e^x &= \frac{a}{b} \\ \rightarrow b \cdot e^x &= a \end{aligned}$$

$$[A] = [A]_0 e^{-kt}$$

$$\ln [A] = \ln [A]_0 - kt$$

$y \qquad b \qquad + \quad mx$

Rewriting after the integration so that it is in $y=mx+b$ form
→ $\ln [A]$ + $\ln [A]_0$ constants, so is k , t is the variable

2nd order (simple)



Start w/
2nd Derived LAW

$$-\frac{d[A]}{dt} = k[A]^2$$

Switch $[A]^2$ & k
as before

$$-\frac{d[A]}{[A]^2} = k dt$$

Pops out
(constant)

Integrate

$$-\int_{[A]_0}^{[A]} \frac{d[A]}{[A]^2} = \int_0^t k dt$$

Constant again, pops out
 $\int dt = t$

$$\int \frac{1}{x^2} dx = \frac{1}{x}$$

$$\frac{1}{[A]} \Big|_{[A]_0}^{[A]} = kt \Big|_0^t$$

Initial = final
Points evaluated

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

Bring to other
side

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

$$y = b + mx$$

Now of form $y = mx + b$

$$\rightarrow \frac{1}{[A]} = \frac{1}{[A]_0} + k \text{ constants, } t \text{ is variable}$$