$$A \underset{k_-}{\overset{k_+}{\rightleftharpoons}} B$$

$$\frac{dc_A}{dt} = -k_+ c_A + k_- \cdot c_B$$

$$\frac{dc_B}{dt} = +k_+ c_A - k_- c_B$$

$$c_0 = c_A(t) + c_B(t)$$

$$c_B(t) = c_0 - c_A(t)$$

$$\frac{dc_A}{dt} = -k_+ c_A + k_-(c_0 - c_A(t))$$

$$\frac{dc_A}{dt} = -c_A(k_+ + k_-) + k_- c_0$$

$$\frac{dc_A}{-c_A(k_+ + k_-) + k_- c_0} = dt$$

$$u = -c_A(k_+ + k_-) + k_- c_0$$

$$du = -(k_+ + k_-) \cdot dc_A$$

$$\frac{1}{-(k_+ + k_-)} \int \frac{du}{u} = \int dt$$

$$\frac{1}{-(k_+ + k_-)} \cdot \ln\left(-(k_+ + k_-) c_A + k_- c_0\right) = t + C''$$

$$-(k_+ + k_-) c_A + k_- c_0 = C' \cdot \exp(-(k_+ + k_-) \cdot t)$$

$$c_A(t) = \frac{1}{k_+ + k_-}\left(k_- c_0 - C' \exp(-(k_+ + k_-)t)\right)$$

$$c_A(0) = c_0$$

$$\hookrightarrow c_0 = \frac{1}{k_+ + k_-}\left(k_- c_0 - C'\right)$$

$$C' = k_- c_0 - (k_+ + k_-) c_0$$

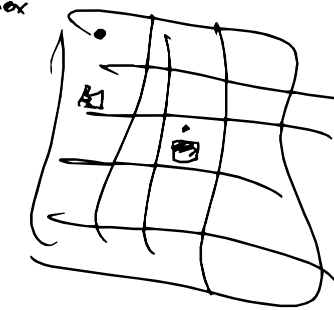
$$= -k_+ c_0$$

$$c_A(t) = \frac{k_- c_0}{k_+ + k_-} + \frac{k_+ c_0}{k_+ + k_-} \exp(-(k_+ + k_-)t)$$

$$c_B(t) = \frac{k_+ c_0}{k_+ + k_-} - \frac{k_+ c_0}{k_+ + k_-} \exp(-(k_+ + k_-)t)$$

$$R + L \underset{k_{off}}{\overset{k_{on}}{\rightleftharpoons}} RL$$

Ω = # Boxes
ν = volume of Box



$$\frac{\Delta N_{RL}}{\nu\cdot\Omega} = -k_{off}\cdot\frac{N_{RL}\cdot\Delta t}{\nu\cdot\Omega} + k'_{on}\cdot p_L\cdot p_R\cdot\frac{\Omega\cdot\Delta t}{\nu\cdot\Omega}$$

$$\frac{\Delta c_{RL}}{\Delta t} = -k_{off}\, c_{RL} + k'_{on}\,\frac{N_L}{\Omega\nu}\cdot\frac{N_R\,\nu}{\Omega\,\nu}\,\frac{1}{\cancel{\nu}}$$

$$k_{on} = k'_{on}\cdot\nu$$

$$\boxed{\frac{dc_{RL}}{dt} = -k_{off}\, c_{RL} + k_{on}\, c_R\cdot c_L}$$

$$A + B \underset{k_-}{\overset{k_+}{\rightleftharpoons}} C$$

$$\frac{dc_A}{dt} = -k_+ c_A c_B + k_- c_C$$

$c_A + c_C = const$ initial $c_{C,0} = 0$

$c_B + c_C = const$

$$c_C(t) = c_{A,0} - c_A(t) = c_{B,0} - c_B(t)$$

$$c_B(t) = c_{B,0} - c_{A,0} + c_A$$

$$\frac{dc_A}{dt} = -k_+ c_A (c_{B,0} - c_{A,0} + c_A) + k_- (c_{A,0} - c_A)$$

$$= -k_+ c_A^2 - k_+ (c_{B,0} - c_{A,0} + k_-) c_A + k_- c_{A,0}$$

$$\frac{dc_A}{dt} = -k_+ \left(c_A^2 + (c_{B,0} - c_{A,0} + k_-) c_A - \frac{k_-}{k_+} c_{A,0} \right)$$

$\Rightarrow \Delta c = c_{B,0} - c_{A,0}$; $\frac{k_+}{k_-} = K$

$$\frac{dc_A}{(c_A - \lambda_1)(c_A - \lambda_2)} = -k_+ \cdot dt$$

$$\lambda_{1/2} = -\frac{1}{2}\left(\Delta c + \frac{1}{K}\right) \pm \sqrt{\frac{1}{4}\left(\Delta c + \frac{1}{K}\right)^2 - \frac{c_{B,0}}{K}}$$

$$\frac{1 \cdot dc_A}{(c_A - \lambda_1)(c_A - \lambda_2)} = \frac{1}{\lambda_1 - \lambda_2}\left(\frac{dc_A}{(c_A - \lambda_1)} - \frac{dc_A}{(c_A - \lambda_2)} \right)$$

$$\frac{1}{\lambda_1 + \lambda_2}\left(\frac{dc_A}{(c_A - \lambda_1)} - \frac{dc_A}{(c_A - \lambda_2)} \right) = -k_+ dt$$

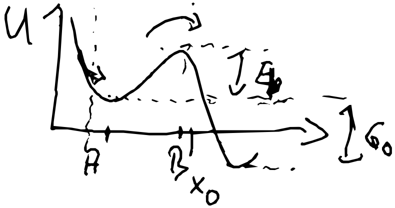
$$\ln(c_A - \lambda_1) - \ln(c_{A,0} - \lambda_1) - \ln(c_A - \lambda_2)$$

$$+ \ln(c_{A,0} - \lambda_2) = \left(-(\lambda_1 + \lambda_2) k_+ t \right)$$

$$\ln\left(\frac{c_A - \lambda_1}{c_A - \lambda_2}\right) - \ln\left(\frac{c_{A,0} - \lambda_2}{c_{A,0} - \lambda_1}\right) = -(\lambda_1 + \lambda_2) k_+ t$$

$$\frac{c_A - \lambda_1}{c_A - \lambda_2} = \underbrace{\frac{c_{A,0} - \lambda_1}{c_{A,0} - \lambda_2} \cdot \exp\left(-(\lambda_1 + \lambda_2) k_+ t\right)}_{= F(t)}$$

$$\boxed{c_A = \frac{\lambda_1 - \lambda_2 F(t)}{1 - F(t)}}$$



$$j(A) = j(B) = j_0$$

$$c(x_0) = 0$$

$$\gamma v = F = -\frac{dU}{dx}$$

$$j(x) = v(x)\cdot c(x) - D\frac{dc}{dx} = j_0$$

$$D = \frac{k_B T}{\gamma}$$

$$j_0 = -\frac{c(x)}{\gamma}\cdot\frac{dU}{dx} - D\frac{dc}{dx} \quad \Big|\cdot\gamma$$

$$\boxed{-\gamma j_0 = c(x)\frac{dU}{dx} + \gamma D\frac{dc}{dx}}$$