

6) Üç Boyutlu veya Farklı Koordinatlarda Fick'in 2. Yasası

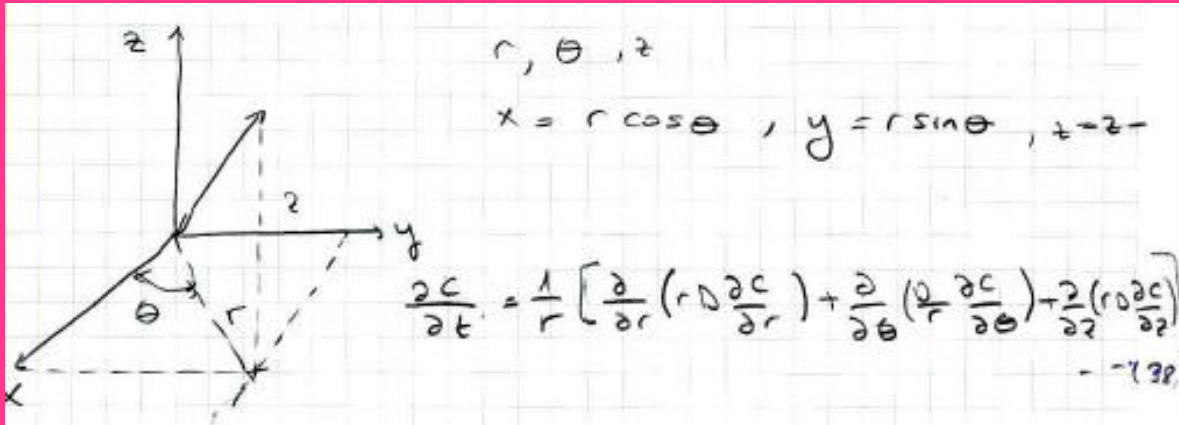
- x, y, z yönünde değişim varsa;

$$\frac{\partial c}{\partial t} = \frac{\partial}{\partial x} \left(D \frac{\partial c}{\partial x} \right) + \frac{\partial}{\partial y} \left(D \frac{\partial c}{\partial y} \right) + \frac{\partial}{\partial z} \left(D \frac{\partial c}{\partial z} \right)$$

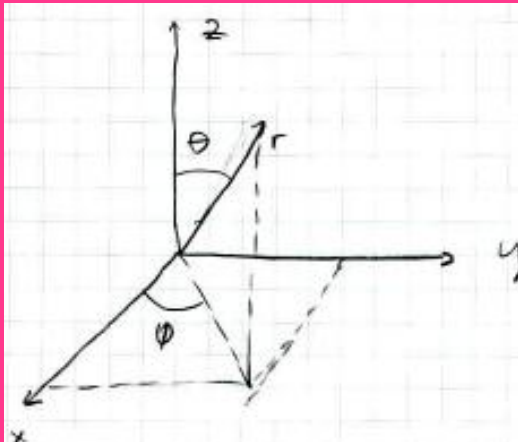
Difüzyon katsayısı sabitse:

$$\frac{\partial c}{\partial t} = D \left(\frac{\partial^2 c}{\partial x^2} + \frac{\partial^2 c}{\partial y^2} + \frac{\partial^2 c}{\partial z^2} \right)$$

○ Silindirik koordinat sisteminde



○ Küresel koordinat sisteminde


$$\begin{aligned}x &= r \sin \theta \cos \phi \\y &= r \sin \theta \sin \phi \\z &= r \cos \theta\end{aligned}$$
$$\frac{\partial c}{\partial t} = \frac{1}{r^2} \left[\frac{\partial}{\partial r} \left(r^2 \frac{\partial c}{\partial r} \right) + \frac{1}{\sin \theta} \frac{\partial}{\partial \theta} \left(\sin \theta \frac{\partial c}{\partial \theta} \right) + \frac{\partial}{\partial \phi} \left(\frac{\partial c}{\sin^2 \theta \partial \phi} \right) \right]$$