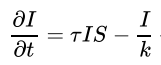
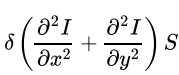
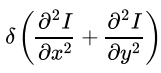
Project 2A

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**Explain the diffusion-based model**

Originally, we have model. The new term  represents diffusion term that allows infected individuals to affect susceptible individuals that are close to them in space. This term is added to I(t,x,y) and subtracted from S(t,x,y). This means that once adding this term, neighbors which are more close to the infected cells have higher probability to be infected. Because only the susceptible ones will be infected, we multiply the diffusion term  with S. This term introduces the **Fick's second law** to predict how diffusion causes the concentration to change with time. In 1-D diffusion we will only have diffusion on one dimension and since we are simulating over 2-D space we compute the diffusion terms along both x and y axis.

C:\Users\Administrator\AppData\Roaming\Tencent\Users\344748443\QQ\WinTemp\RichOle\YH$`M8N5%6}}OCTLWF~K%~1.png is the diffusion coefficient which has units of squared length over time. This constant is reasonable and we can see that from the units. I(t,x,y) represents the concentration of infected people in cell (x,y) at time t. It has the unit (#of infected people)/unit area. Then has unit (#of infected people)/(unit area\*unit time). On the RHS, the term has unit (#of infected people)/(unit area^3) since we do partial differentiation twice on I(t,x,y). Obviously, we need a constant which has unit (unit area^2)/(unit\*time) to balance two sides Depending on how we want to bias the diffusion direction we can set different value for the diffusion coefficient.

**Implement Model 4**