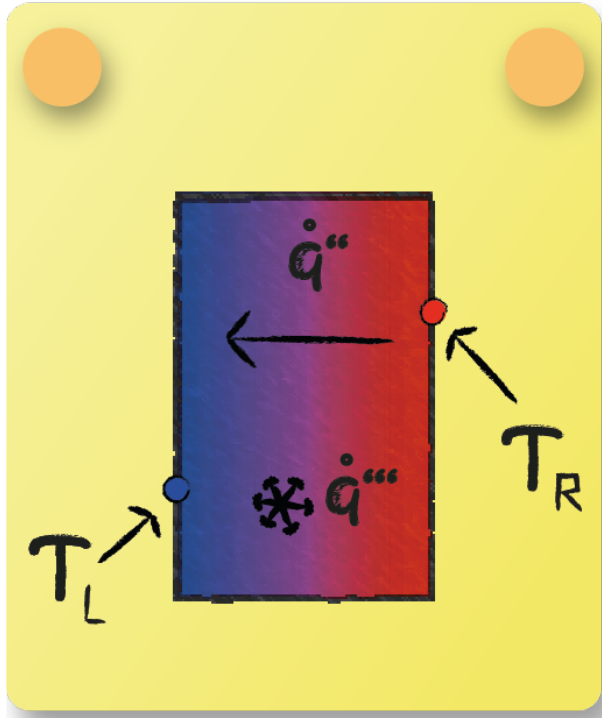# Lecture 3 - Question 4

Which of the following equations describes the 3-dimensional transient heat diffusion process with sources?

The general heat conduction equation derived for a control volume with constant thermal conductivity can be written as:

$$\frac{\rho c}{\lambda}\frac{\partial T}{\partial t} = \frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} + \frac{\dot{\Phi}'''}{\lambda}$$

It states that temporal change in internal energy (temperature) is composed of ingoing and outgoing conduction energy fluxes (divergence of the temperature field) and heat sources and sinks, respectively. Common notations for heat sources/sinks are $\dot{\Phi}'''$ just as $\dot{q}'''$ which represent a volume specific heat flux that is positive for sources and negative for sinks.