The Heat Equation.

The Heat (or Diffusion) Equation for a vector $\mathbf{u}$=(u_1(x,y,z,t),u_2(x,y,z,t),u_3(x,y,z,t)) is:

$$\frac{\partial \mathbf{u}}{\partial t} = \nabla^2 \mathbf{u} \tag{1}$$

This can be expanded as

$$\frac{\partial u_1}{\partial t} = \frac{\partial^2 u_1}{\partial x^2} + \frac{\partial^2 u_1}{\partial y^2} + \frac{\partial^2 u_1}{\partial z^2} \tag{2}$$

for the first component, and similarly for the second and third.