Summary of lecture 12-Directional derivatives, div and $\nabla^2 f$

Directional derivative

- This is the rate of change of a scalar field f in the direction of a *unit* vector $\mathbf{u} = (u_1, u_2, u_3)$.
- the key formula is:

$$\boxed{\frac{\partial f}{\partial \mathbf{u}} = \mathbf{u} \cdot \nabla f = u_1 \frac{\partial f}{\partial x} + u_2 \frac{\partial f}{\partial y} + u_3 \frac{\partial f}{\partial z}} \, .$$

- Important: only valid for *unit* vectors $\mathbf{u}$