We should now start thinking of vectors as <u>differential operators</u> on <u>surf's</u>

e.g. $X = m\,\underline{x}_u + n\,\underline{x}_v$

$$\left[\begin{array}{c}\text{Directional Derivative of} \\ f \text{ in } X \text{ dir.n}\end{array}\right] = Xf$$

$$= \lim_{\varepsilon \to 0}\left(\frac{f(\underline{x}+\varepsilon X) - f(\underline{x})}{\varepsilon}\right) = m\sum_i \frac{\partial f}{\partial x_i}\cdot\frac{\partial x_i}{\partial u} + n\sum_i \frac{\partial f}{\partial x_i}\frac{\partial x_i}{\partial v}$$

$$= m\frac{\partial f}{\partial u} + n\frac{\partial f}{\partial v}$$

$$= \left(m\frac{\partial}{\partial u} + n\frac{\partial}{\partial v}\right)\cdot f$$

→ it is often convenient to write basis vectors

$\underline{x}_u, \underline{x}_v$ as $\frac{\partial}{\partial u}, \frac{\partial}{\partial v}$