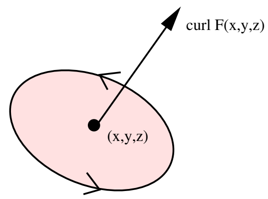
Summary of lecture 14 - Curl

CURL



- Let $\mathbf{F} = (F_1, F_2, F_3)$ be a vector field then

$$\boxed{\operatorname{curl} \mathbf{F} = \left(\frac{\partial F_3}{\partial y} - \frac{\partial F_2}{\partial z}\right)\mathbf{i} + \left(\frac{\partial F_1}{\partial z} - \frac{\partial F_3}{\partial x}\right)\mathbf{j} + \left(\frac{\partial F_2}{\partial x} - \frac{\partial F_1}{\partial y}\right)\mathbf{k}}\,.$$

- Particles near (x, y, z) tend to rotate about the axis that points in the direction of $\operatorname{curl} \mathbf{F}(x, y, z)$ and the length of this vector is a measure of how quickly the particles move round the axis.

- If $\operatorname{curl} \mathbf{F}(x, y, z) = 0$ at a point P, then the fluid is free from rotations at P. $\mathbf{F}$ is *irrotational* at P.