Spinning plates

Consider a uniform *disc* rotating at angular frequency ω about its *axis*. Further consider a *line segment* on this *disc* whose *distinct end points* are p and q. Let *axial distances* of p and q be ε and δ respectively. The rotational speeds of *distinct end points* p and q are respectively:

$$\omega \cdot \varepsilon \ (1)$$

$$\omega \cdot \delta \ (2)$$

The difference in rotational speeds, $\mathbf{\Omega}[\varepsilon, \delta]$, satisfies:

$$\mathbf{\Omega}[\varepsilon, \delta]: \quad {}^{\boldsymbol{\omega(\varepsilon-\delta)}}_{\boldsymbol{\omega(\delta-\varepsilon)}} < \ \omega(\varepsilon + \delta)$$

$$< \ \omega\varepsilon + \omega\delta \ (3)$$

Let $\varepsilon \to 0$. We find that the rotational speed of point p is bound by zero from (1) whereas from (3) the difference in rotational speeds is not bound by zero. A *line segment* rotating on a uniform rotating *disc* with some part not rotating does not make a *uniform disc*!

'Spinning plates' are much more involved to model mathematically than a pseudo-mathematical approach involving *discs*, *axes*, and *line segments*. It's with this motivation that we turn to the topic at hand: exchange of quantities against other quantities.