Linear System of Equations

Consider three equations, linear in the unknowns F, G, H:

$a11\ F + a12\ G + a13\ H = 0$

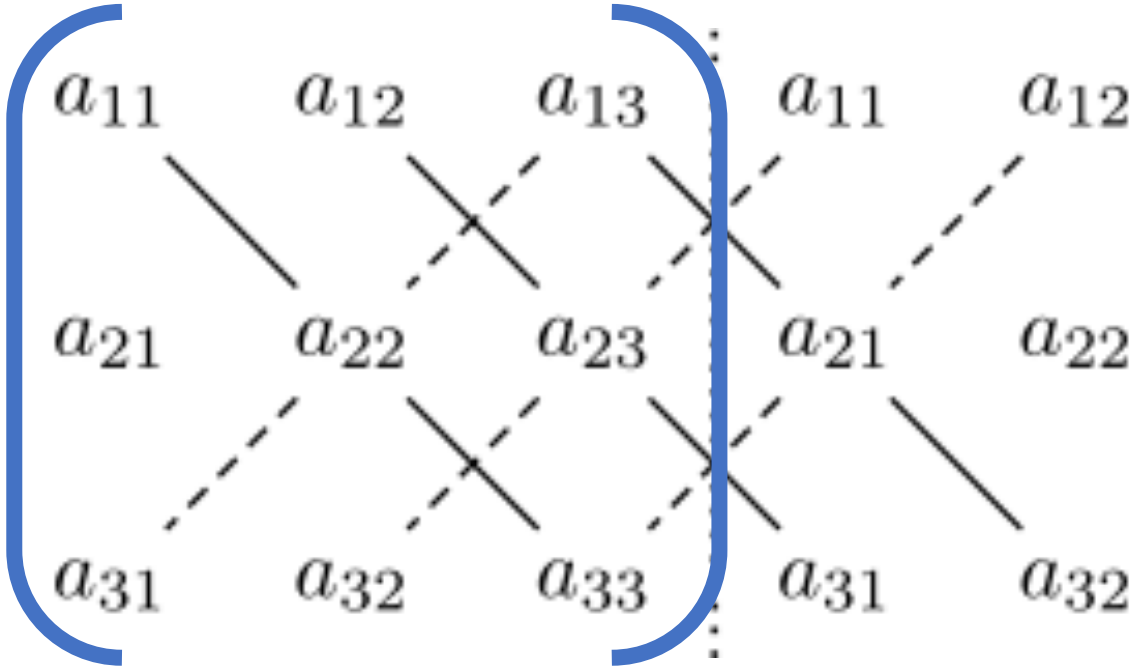
$a21\ F + a22\ G + a23\ H = 0$

$a31\ F + a32\ G + a33\ H = 0$

Can we have a non-trivial solution?

(A trivial solution is F=G=H=0 – not usually of interest.)

Determinant



A non-trivial solution requires determinant = 0, or

(a11)(a22)(a33) + (a12)(a23)(a31) + (a13)(a21)(a32)

- (a13)(a22)(a31) - (a11)(a23)(a32) - (a12)(a21)(a33)

= 0

From Thompson (1961)

	v'	$\partial h'/\partial x$	$\partial u'/\partial x$
Vorticity equation	$\beta - k^2(\bar{u} - c)$	0	f
u-momentum equation	- f	g	$(\bar{u} - c)$
Mass continuity equation	- f$\bar{u}$/g	$(\bar{u} - c)$	$\bar{h}$

Thus, to have a non-trivial solution for c, determinant = 0 ➔

$$[\beta - k^2(\bar{u} - c)]\left[g\bar{h} - (\bar{u} - c)^2\right] - f^2\,[(\bar{u} - c) - \bar{u}] = 0$$