$E = E(S, V)$; $W = W(S, V)$

$F = (T, V)$; $\Phi = \Phi(T, P)$

$F = E - TS$; $S = -\left(\frac{\partial F}{\partial T}\right)_V$

$E = F + TS$

$E = F - T\left(\frac{\partial F}{\partial T}\right)_V$ — (T, V)

$E(T, V) = F(T, V)$

Jacobians $u = u(x, y)$; $v = v(x, y)$

$$\frac{\partial(u, v)}{\partial(x, y)} = \begin{vmatrix} \frac{\partial u}{\partial x} & \frac{\partial u}{\partial y} \\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} \end{vmatrix} = \frac{\partial u}{\partial x}\frac{\partial v}{\partial y} - \frac{\partial u}{\partial y}\frac{\partial v}{\partial x}$$

$$\frac{\partial(u, v)}{\partial(x, y)} = -\frac{\partial(u, v)}{\partial(y, x)} = -\frac{\partial(v, u)}{\partial(x, y)}$$

$$\frac{\partial(u, y)}{\partial(x, y)} = \left(\frac{\partial u}{\partial x}\right)_y \swarrow$$

Generalized Chain rule

$(u, v)\ (s, t)\ (x, y)$

$$\frac{\partial(u, v)}{\partial(x, y)} = \frac{\partial(u, v)}{\partial(s, t)} \frac{\partial(s, t)}{\partial(x, y)} \swarrow$$