Exercise sheet 2

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Contents

1   problem 1 - Thermodynamic Potentials and State Variables

1.1   (a,2P)

show:

$$\left(\frac{\partial f}{\partial u}\right)_v \left(\frac{\partial u}{\partial f}\right)_v = 1 \tag{1}$$

we may write:

$$u = f^{-1}\left(f(u)\right) \tag{2}$$

with that we can write for the differential

$$du = df^{-1} = \left(\frac{\partial f^{-1}}{\partial f}\right)_v \left(\frac{\partial f}{\partial u}\right)_v du = \left(\frac{\partial u}{\partial f}\right)_v \left(\frac{\partial f}{\partial u}\right)_v du \tag{3}$$

by comparing the l.h.s with the r.h.s we get:

$$\left(\frac{\partial u}{\partial f}\right)_v \left(\frac{\partial f}{\partial u}\right)_v = 1 \quad \square \tag{4}$$