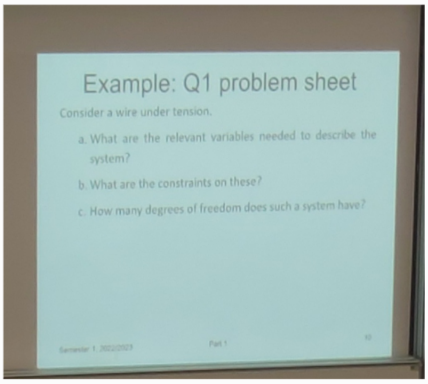


why don't we consider the mass?

a. m, F, t, l, V, r, temperature

b. $r - m - F - V$

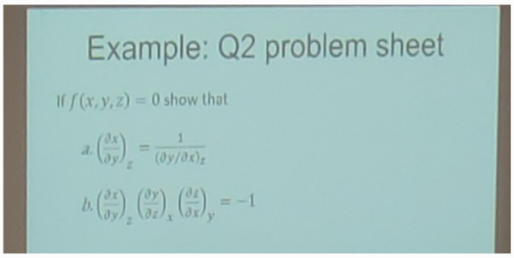
b) $f(l, T, t) = 0$

$f(l, T, t, d) = 0$

c. 2 ✓

+1 if considering diameter

non examinable



indep variables

$$f(x,y,z) = 0 \longrightarrow x = x(y,z)$$

$$dx = \left(\frac{\partial x}{\partial y}\right)_z dy + \left(\frac{\partial x}{\partial x}\right)_y dz$$

subscript = const

Or $y = y(x,z)$

$$dy = \left(\frac{\partial y}{\partial x}\right)_x dx + \left(\frac{\partial y}{\partial x}\right)_x dz$$

$$dx = \left(\frac{\partial x}{\partial y}\right)_x \left[\left(\frac{\partial y}{\partial x}\right)_z dx + \left(\frac{\partial y}{\partial z}\right)_x dz\right] + \left(\frac{\partial x}{\partial z}\right) dz$$

$$dx = \left(\frac{\partial x}{\partial y}\right)_z \left(\frac{\partial y}{\partial x}\right)_z dx + \left[\left(\frac{\partial x}{\partial y}\right)_z \left(\frac{\partial y}{\partial z}\right)_x + \left(\frac{\partial x}{\partial z}\right)_y\right] dz$$

This is irrespective of choice of indep variable.

a) set $dx = 0$

$$\left(\frac{\partial x}{\partial y}\right)_z \left(\frac{\partial y}{\partial x}\right)_x = 1$$

or $\left(\frac{\partial x}{\partial y}\right) = \frac{1}{(\partial y/\partial x)_z}$ Reciprocal theorem

This must be irrespective of choice of indep v

b) Set $dx = 0$

$$\left(\frac{\partial x}{\partial y}\right)_z \left(\frac{\partial y}{\partial z}\right)_x = -\left(\frac{\partial x}{\partial z}\right)_y$$

or

$$\left(\frac{\partial x}{\partial y}\right)_t \left(\frac{\partial y}{\partial z}\right)_x \left(\frac{\partial z}{\partial x}\right)_y = -1$$

Reciprocal thm