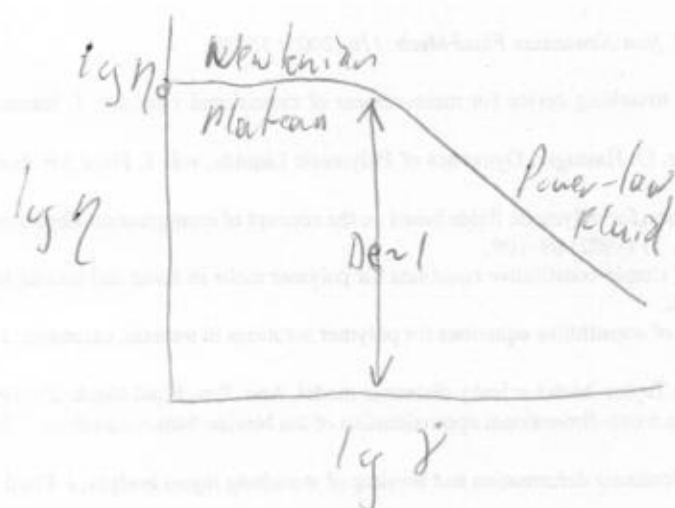
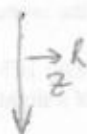


a)



b)



$$\tau_{zz} - \tau_{rr} = N_1$$

$$\tau_{zz} = \frac{dF_z}{dA_z}$$

Tensile Stress

$$\tau_{rr} = \frac{dF_r}{dA_r}$$

Normal Stress

A normal stress develops when there is a complex structure in the fluid that can convert "zz" stress into "rr" stress. This occurs when the polymer deforms.

In the Newtonian condition $\tau_{visc} \ll \tau_{process}$ so the chains relax but there is still a conversion of τ_{zz} to τ_{rr} .