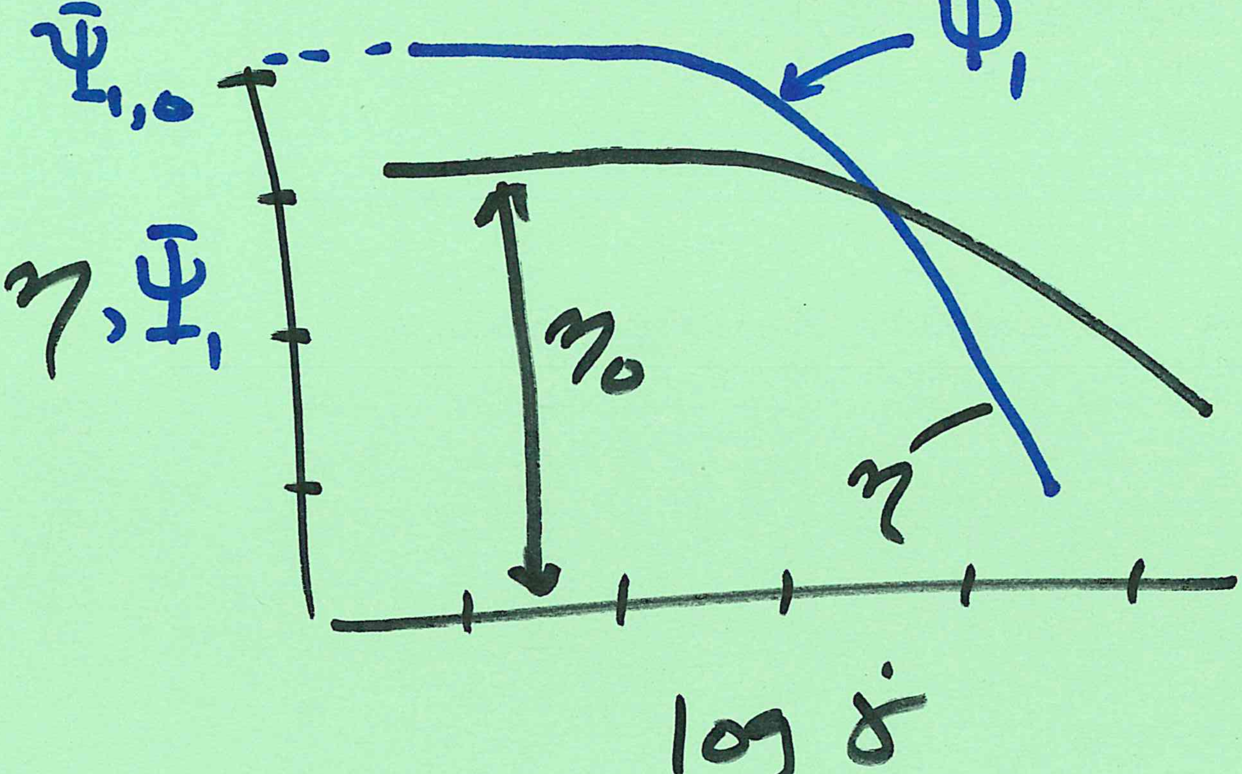
MATERIAL BEHAVIOR TO KNOW FOR EXAM 2

CM450
2018

MATERIAL BEHAVIOR

Steady Shear flow

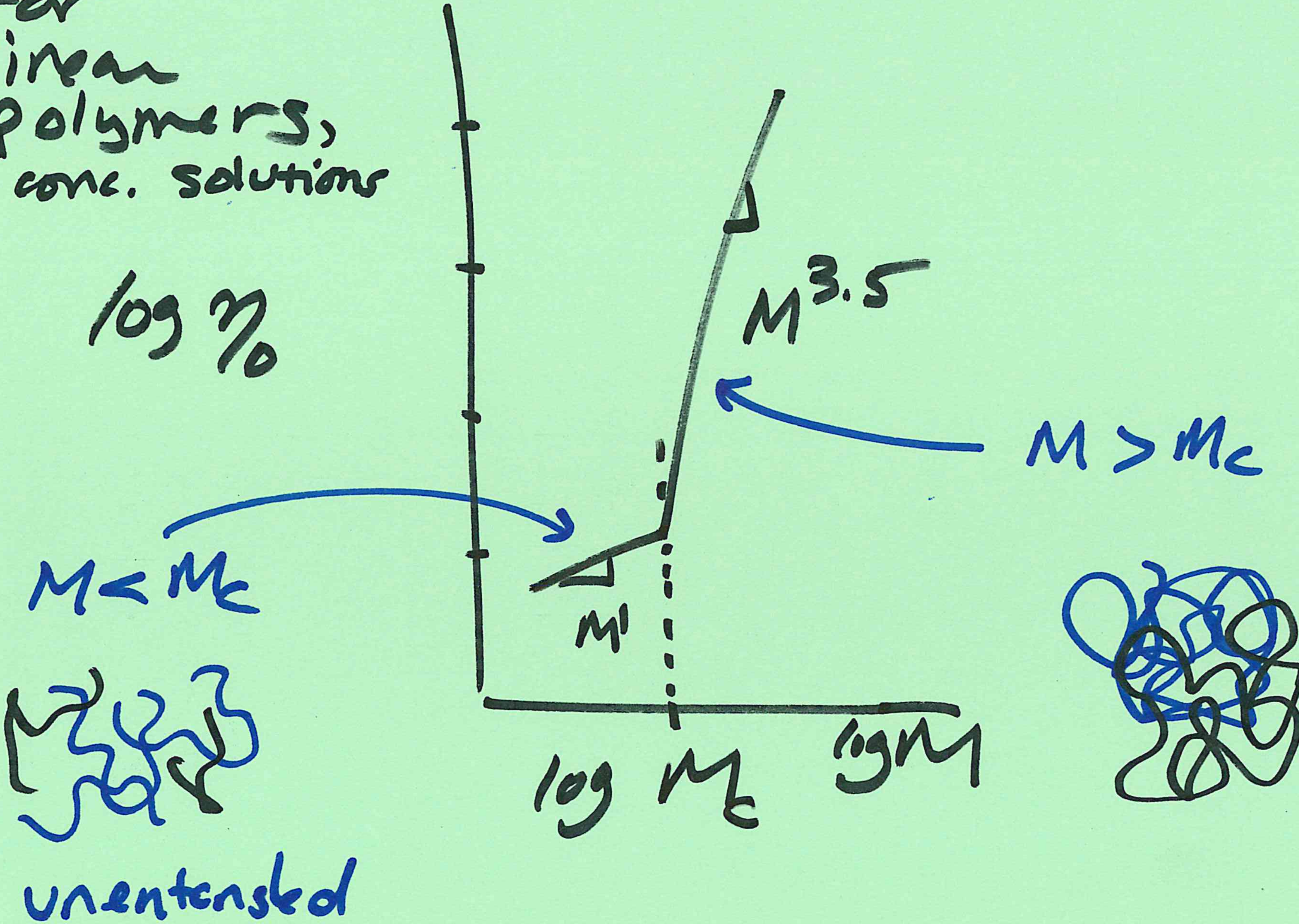
19 MAR 2018 CMY65D



η_0 = zero shear viscosity

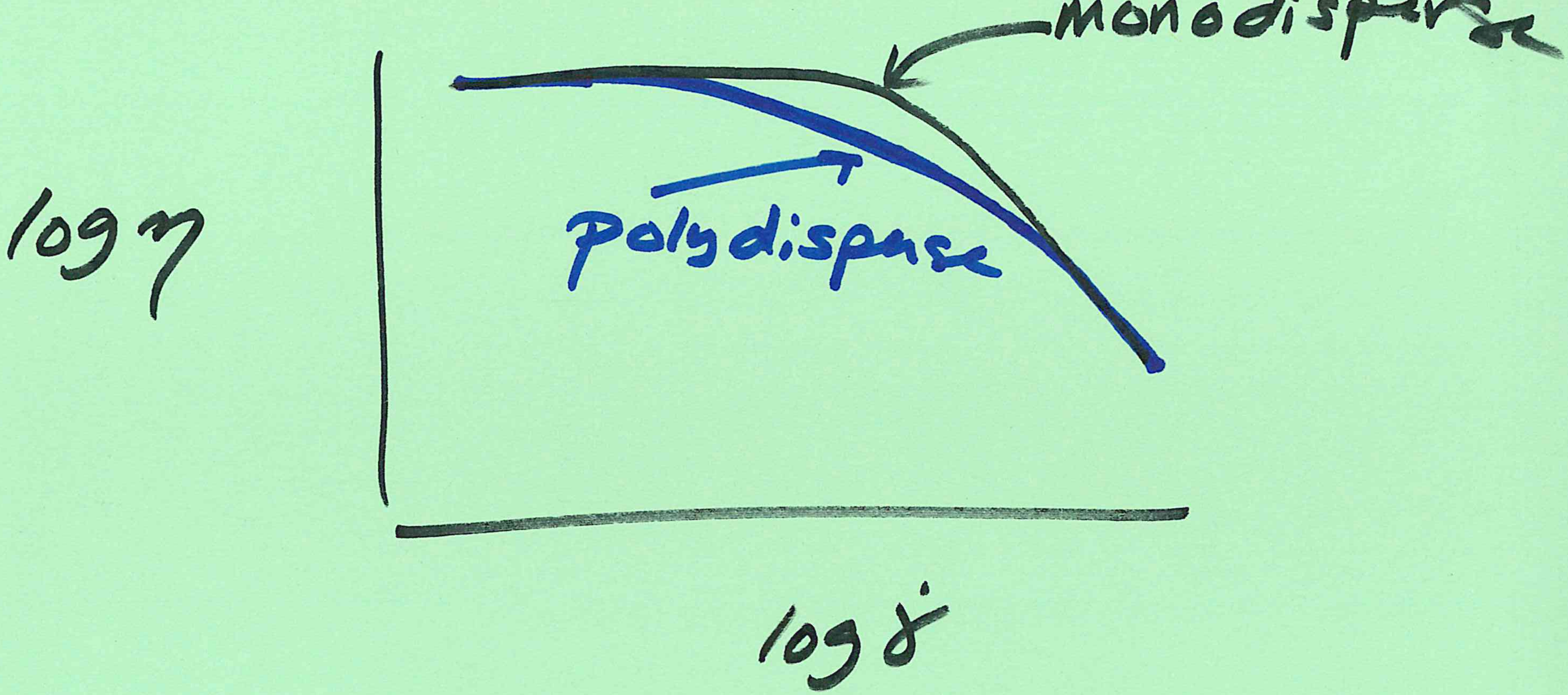
linear, long chain polymer melt & polymer solutions (concentrated)

For linear polymers, + conc. solutions



M_c = critical MW for entanglement

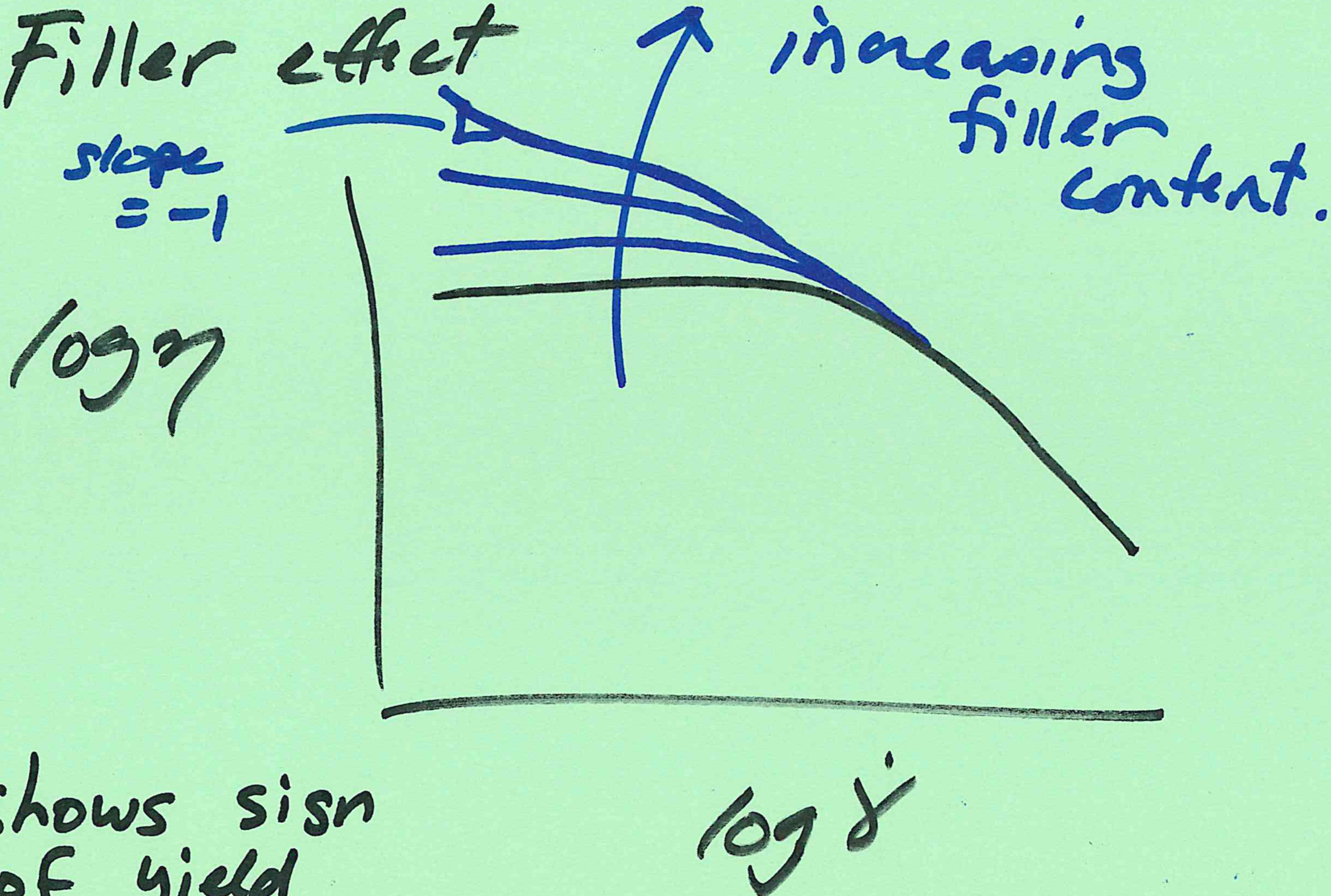
Effect of MWD
(molec. wt. distribution)



broadening the MWD broadens + smooths the transition from η_0 to the shear thinning regime

MIXTURES

Filler effect



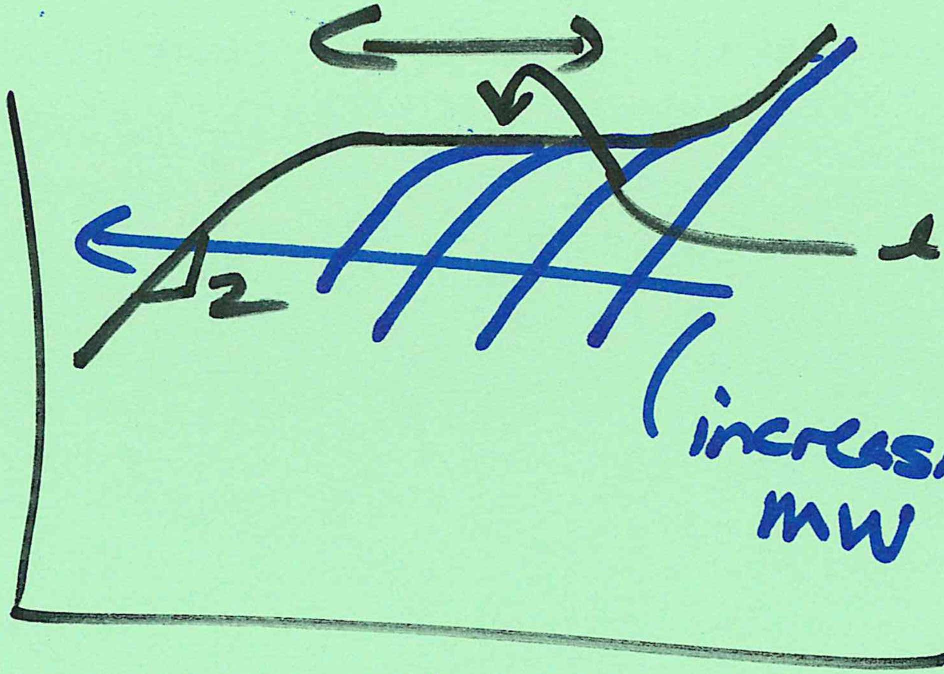
- shows sign of yield stress

end of steady shear

unsteady shear

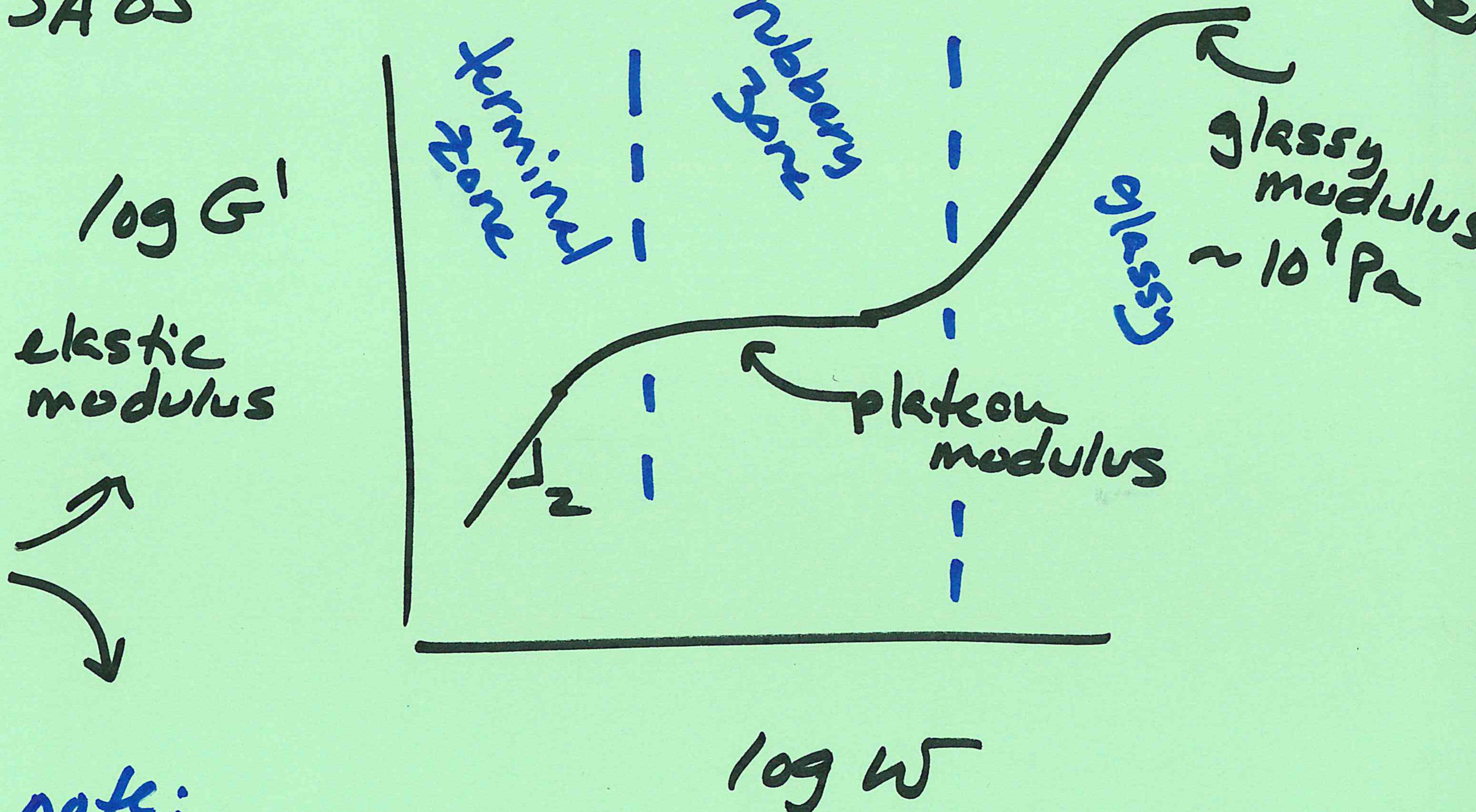
SAOS

broadens w/ increasing MW



at low w,
$G' \propto w^2$
in the terminal zone

SAOS



note:
viscous modulus G''
$G'' \propto \omega^1$
at low frequency

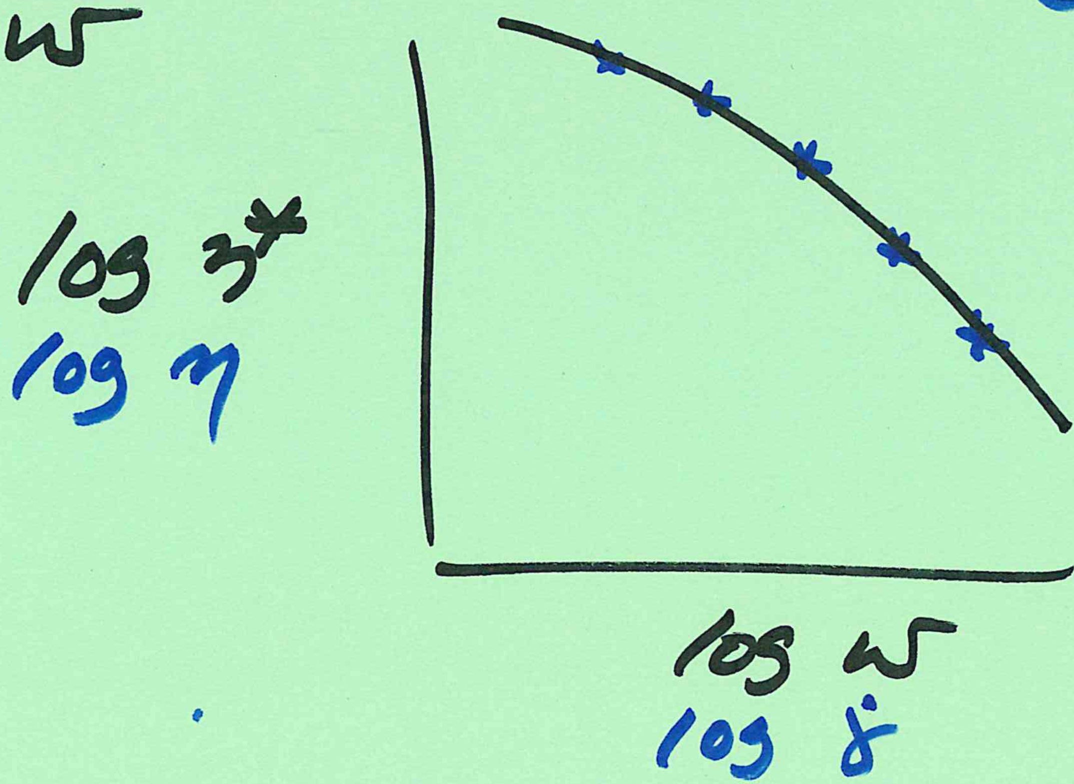
long linear polymers entangled

SAOS can predict Steady Shear for some materials

$$(G^*)^2 = (G')^2 + (G'')^2$$

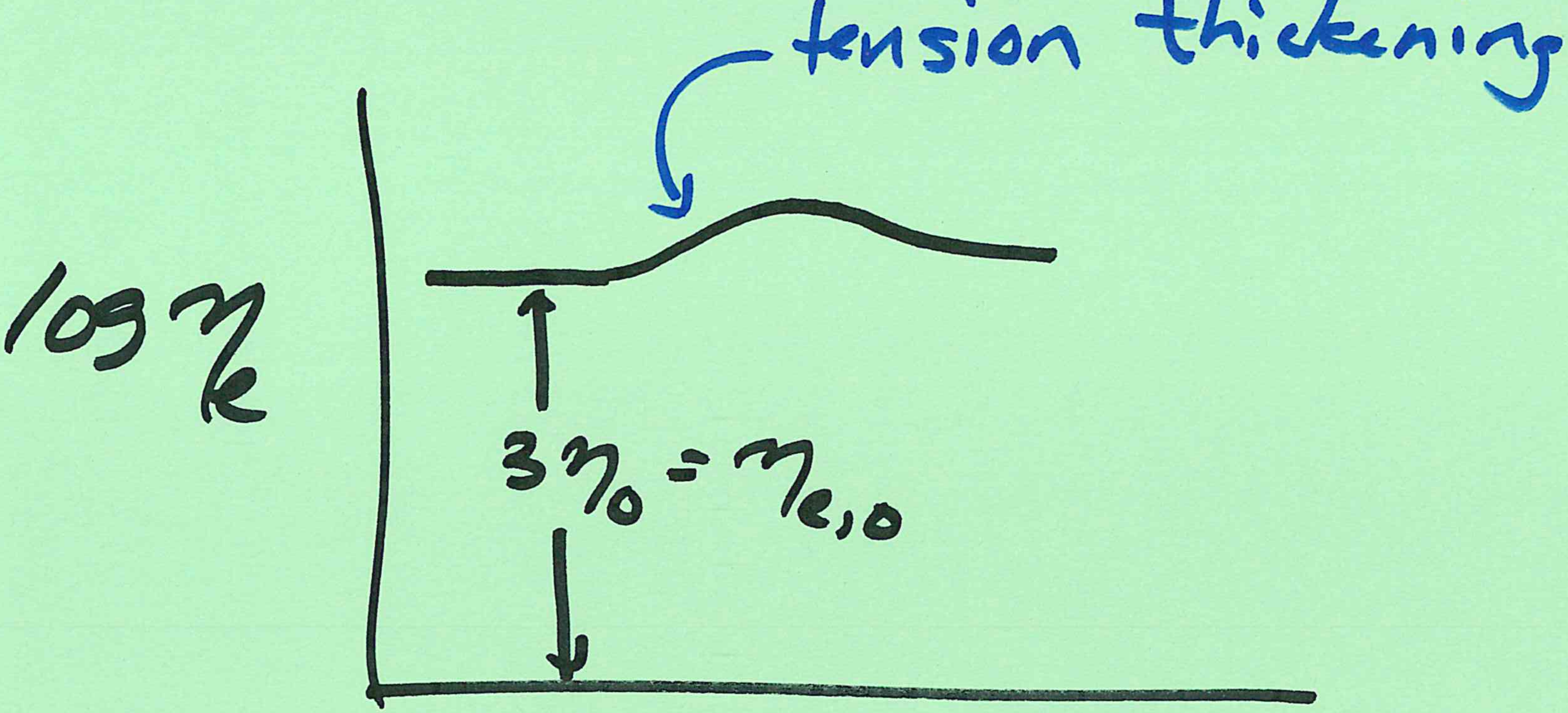
$$\eta^* = \frac{G^*}{\omega}$$

complex modulus



Cox Merz "Rule"

Steady elongational viscosity



$\log \dot{\varepsilon}_0$

Trouton Ratio

$\eta_{e,0} = 3\eta_0$

elongation low rate viscosity

shear low rate viscosity

$$Tr = \frac{\eta_{e,0}}{\eta_0} \approx 3$$

End.