NOTES CLASS 10-12-2017

MAIN DIFFERENCES IN PRESSURE BETWEEN NEWTONIAN AND VISCOELASTIC MATERIAL IN SLIDE 2 OF LECTURE 7

VISCOELASTIC MATERIAL DOES NOT REACH THE ATMOSPHERIC PRESSURE ONCE IS OUT OF THE EXTRUDER (DIE), WHILE THE NEWTONIAN MATERIAL DOES.

THE VISCOELASTIC MATERIAL HAS MEMORY

STRESS IS THE NORMALIZATION OF THE APPLIED FORCE, THE WAY TO DO IT, IT IS DIVIDING THE FORCE BY THE AREA

$$\text{STRESS} = \frac{\text{FORCE}}{\text{AREA}}$$

STRAIN = RELATIVE DEFORMATION = MEASURED DEFORMATION / "OTHER SIZE CHARACTERISTIC"

↗ INITIAL "SIZE" OF MATERIAL

UNITS FOR STRESS = $\frac{\text{Newtons}}{m^2}$ = Pascal (2)

Pascal ≡ Pa

STRESS IN ENGLISH SYSTEM = $\frac{F}{A} = \frac{lbf}{ft^2} = \frac{32.2\ lb_m \times ft/s^2}{ft^2}$ ← gravity

UNITS FOR STRAIN = NO UNITS

UNITS FOR STRAIN RATE = $\frac{1}{s}$

↑ How Strain changes with time

UNITS OF VISCOSITY ? WILL RELATE STRESS [Pa] WITH STRAIN RATE [$1/s$]

VISCOSITY OF WATER? 1 cP = 1 centi Poise

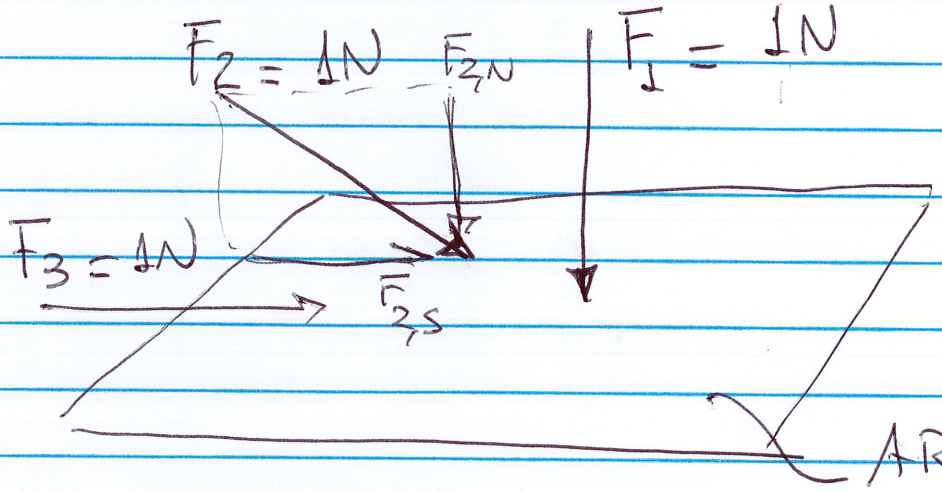
1 CENTI POISE = 1 cP

CENTIPOISE = 10^{-2} x Poise. = 10^{-2} x $\frac{1\ g}{cm \times s}$

CENTI — Poise

GOING BACK TO STRESS

$$\text{STRESS} = \frac{\text{FORCE}}{\text{AREA}}$$

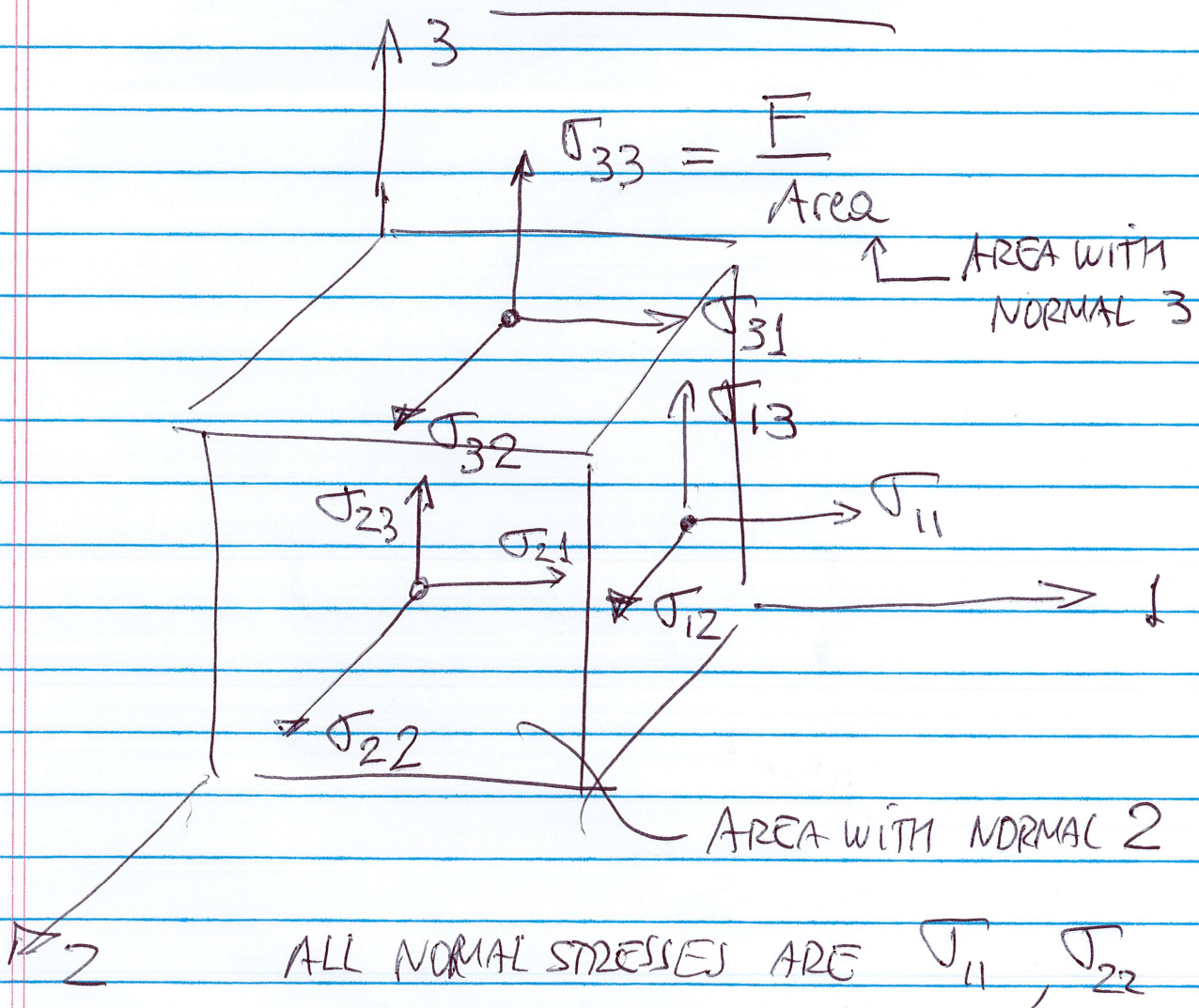


$$\text{STRESS}_1 = \frac{1N}{1m^2} = \frac{F_1}{A} = 1\ Pa.$$ [NORMAL STRESS = PRESSURE]

STRESS_2 = ?? → SHEAR STRESS / NORMAL STRESS

STRESS_3 = ?? = $\frac{F_3}{A}$ SHEAR STRESS

WE CANNOT CALCULATE THE STRESS GIVEN ONLY THE MAGNITUDE OF THE FORCE BECAUSE FORCE ~~IS~~ IS A VECTOR AND WE ONLY NEEDS THE DIRECTION



ALL NORMAL STRESSES ARE σ_{11}, σ_{22} AND σ_{33}, THE TANGENTIAL STRESSES (SHEAR STRESSES) ARE σ_{12}, σ_{21}, σ_{31}, ...