Assignment 2

1. Prove that G' and G'' as a function of ω are given in terms of relaxation modulus $G(t)$.

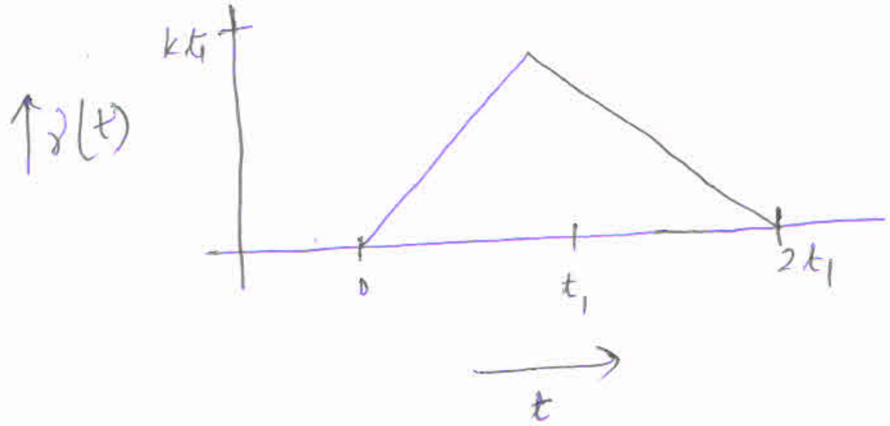
$$G'(\omega) = \omega \int_0^{\infty} G(a)\,(\sin \omega a)\, da$$

$$G''(\omega) = \omega \int_0^{\infty} G(a)\,(\cos \omega a)\, da$$

2. Using the relaxation modulus for single mode Maxwell model $\left(G(t) = G_0 e^{-t/\tau_0}\right)$, prove that G' and G'' are given by,

$$G' = \frac{G_0 \omega^2 \tau^2}{1+\omega^2\tau^2} \quad ; \quad G'' = \frac{G_0 \omega \tau}{1+\omega^2\tau^2}$$

3. The relaxation modulus of a material is given by $G(t) = G_1 e^{-t/\tau_1} + G_2 e^{-t/\tau_2}$. Find out the stress for $t > 2t_1$ for the strain profile shown below.



4. For multimode Maxwell Mode prove that overall viscosity (η) is given by

$$\eta = \sum_{i=1}^{n} G_{0i}\, \tau_{0i}$$

5. The relaxation modulus of a material is given by,

$$G(t) = G_0 e^{-t/\tau}$$

Find out the stress at time $t > t_1$ for the strain profile shown below -