Lecture 6.

Lecture objectives.
- To set up the equation of motion for a forced oscillator.
- To appreciate the difference between transient and steady state motion.
- To be practiced in dealing with complex numbers, and understand their meaning with respect to phase angle.
- To appreciate the function of the "j" operator in representing the phase of a variable.
- To learn the definition of mechanical impedance, both in simple terms and as a complex number.
- To be familiar with the derivation of the displacement-force relation, and the phase relationship between the two

Post-lecture tasks.
- From the complex expression for displacement, extract an expression for the velocity.
- Evaluate the phase relation between velocity and driving force
- The real part of the expression for the displacement is;

$$\text{Re}(x) = \frac{F_0}{\omega |Z_m|} \sin(\omega t - \phi)$$

Prove that this is a maximum when;

(Hint: differentiate x w.r.t. ω)

$$\omega = \sqrt{\frac{k}{m} - \frac{b^2}{2m^2}}$$