Group members (2 to 4):

Consider the forced mass-spring system $mx'' + cx' + kx = F_0 \cos(wt)$, which for c > 0 has the steady-state solution $x_p = C(w) \cos(wt - \alpha)$, where the amplitude function is

$$C(w) = \frac{F_0/m}{\sqrt{(w^2 - w_0^2)^2 + c^2 w^2}}$$

(in terms of the natural frequency $w_0 = \sqrt{k/m}$).

(1) For fixed m, c, k, and F_0 , find the frequency w which maximizes the amplitude C(w).

Hint: this is equivalent to finding the minimum of $(w^2 - w_0^2)^2 + c^2 w^2$.

(2) Again for fixed m, c, k, and F_0 , find the frequency w which maximizes the amplitude of the velocity of the steady-state solution.