

Problem 18

Consider the forced but undamped system described by the initial value problem

$$u'' + u = 3 \cos \omega t, \quad u(0) = 0, \quad u'(0) = 0.$$

- (a) Find the solution $u(t)$ for $\omega \neq 1$.
- (b) Plot the solution $u(t)$ versus t for $\omega = 0.7$, $\omega = 0.8$, and $\omega = 0.9$. Describe how the response $u(t)$ changes as ω varies in this interval. What happens as ω takes on values closer and closer to 1? Note that the natural frequency of the unforced system is $\omega_0 = 1$.