

1. Write the following functions as a product of two trigonometric functions.

(a)  $\cos(2t) + \cos(3t)$

(b)  $\cos(2t) + \sin(3t)$ . Hint:  $\cos(z) = \sin(z + \pi/2)$  and  $\sin(z) = \cos(z - \pi/2)$ .

2. [3.8.9] An undamped spring-mass system with a mass that weighs 6 lb and a spring constant of 1 lb/in is suddenly set in motion at  $t = 0$  by an external force of  $4 \cos 7t$  lb. Determine the position of the mass  $u(t)$  (in) at time  $t$  (s), expressing  $u(t)$  as a product of two trigonometric functions.

3. Now, modify the system in #2 so that the damping constant is  $\gamma = 1\text{lb} \cdot \text{s/in}$ . Find the forced response  $U(t)$ , expressed in the form  $U(t) = R \cos(7t - \delta)$ . How does the magnitude of the forced response compare with that of the static response? Is this system demonstrating resonance?