

18.03 Recitation 6

Sinusoids

1. Write (a) and (b) in the form $A \cos(\omega t - \phi)$. Write (c) in the form $a \cos(\omega t) + b \sin(\omega t)$.

In each case, begin by drawing a right triangle with sides a and b , angle ϕ , hypotenuse A .

(a) $\cos(2t) + \sin(2t)$.

(b) $\cos(\pi t) - \sqrt{3} \sin(\pi t)$.

(c) $5 \cos\left(3t + \frac{3\pi}{4}\right)$

2. The spring-mass-dashpot system is set up with mass $m = 1(\text{kg})$, spring constant $k = \frac{17}{16} (\text{N/m})$, and damping constant $b = \frac{1}{2} (\text{N s /m})$.

The mass is pulled to 1 m to the **right** of the equilibrium and then pushed and released at a velocity of 0.75m/s to the **right**.

(a) What is the position $x(t)$ of the mass at time t seconds after being released? Answer in amplitude phase form $x(t) = Ae^{-pt} \cos(\omega t - \phi)$.

(b) What are the values of the (pseudo)-period P , (in seconds) the (pseudo)-frequency ν , (in cycles per second) and the time lag t_0 (in seconds) for $x(t)$, ?

(c) When are the first 4 times that the mass crosses the equilibrium position?

(d) Sketch $x(t)$ (use the data you found above).