

PHYS 2601 (Fall 2025): Problem Set 5

Due date: October 12, 9:00am. 50% penalty on late homework.

From Vibrations and Waves (King)

Problem 4.6 (10 pts)

Problem 4.9 (5 pts)

Problem 4.10 (5 pts)

From Vibrations and Waves (French)

Problem 4.8 (5 pts)

4-8 A mass m is subject to a resistive force $-bv$ but *no* springlike restoring force.

(a) Show that its displacement as a function of time is of the form

$$x = C - \frac{v_0}{\gamma} e^{-\gamma t}$$

where $\gamma = b/m$.

(b) At $t = 0$ the mass is at rest at $x = 0$. At this instant a driving force $F = F_0 \cos \omega t$ is switched on. Find the values of A and δ in the steady-state solution $x = A \cos(\omega t - \delta)$.

(c) Write down the general solution [the sum of parts (a) and (b)] and find the values of C and v_0 from the conditions that $x = 0$ and $dx/dt = 0$ at $t = 0$. Sketch x as a function of t .

In your solutions, please provide written comments (in addition to the math) that show your reasoning to receive full credit.

Please submit solutions electronically as a single merged pdf document to gradescope (handwritten or typeset).