

INSTRUCTIONS: PLEASE READ CAREFULLY

Write your name and section number above. 5 pts will deducted if either is missing or illegible.
Write your final answers in the space provided. Show your work on attached sheets. Staple together in the upper-left corner.

Problem 1 (20 pts): DO NOT SOLVE THE DIFFERENTIAL EQUATION.

Just give an appropriate guess for the particular solution of the nonhomogeneous equation.

(a) $y'' - 4y' + 4y = \cos 2x$ _____

(b) $y'' - 4y' + 4y = e^{2x}$ _____

(c) $y'' + 4y = \cos 2x$ _____

(d) $y'' + 4y = x^2 + e^x \cos 2x$ _____

Problem 2 (30 pts): Find the general solution of the ODE

$y'' + 2y' + 4y = 3 \cos x$ _____

Problem 3 (30 pts): Find the general solution of the ODE

$y'' + 4y' + 4y = x^{-2}e^{-2x}$ _____

Problem 4 (20 pts): Consider the forced mass-spring-dashpot ODE with $m > 0$, $k > 0$, and $\beta \geq 0$:

$my'' + \beta y' + ky = f(t)$

(a) If $\beta = 0$ and $f(t) = 0$, what is the frequency of oscillation ω ? _____

(b) If $\beta = 0$, give a simple bounded function $f(t)$ that will cause unbounded growth in $y(t)$ as $t \rightarrow \infty$.

(c) Will the same $f(t)$ cause unbounded growth if β is increased slightly from zero? Why or why not?
