

Instructor: Leopoldo P. Franca

NAME: _____

TEST # 3:

Please show all your work in the test. Guessed answers are NOT acceptable. You may use calculators. Good luck!

(20 pt) 1) The initial-value problem given by

$$\frac{d^2x}{dt^2} + kx = 0$$

$$x(0) = 0$$

$$x'(0) = 1$$

models spring-mass systems with $k = 1, 4$ and 9 . Among the three given k values, which will simulate a motion with the largest amplitude? Explain your answer.

(20 pt) 2) Find the general solution of

$$x^2 y'' + 2xy' - 6y = 2x$$

(20 pt) 3) Find the general solution of

$$x' = -2x - 2y + 4$$

$$y' = -5x + y$$

(40 pt) 4) Solve the following initial value problem using the Laplace transform technique:

$$y'' - y = f(t)$$

$$y(0) = 0$$

$$y'(0) = 0$$

with

$$f(t) = \begin{cases} e^t, & 0 \leq t < 1 \\ 0, & t \geq 1 \end{cases}$$

