

Instructor: Leopoldo P. Franca

NAME: _____

FINAL:

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

(25 pt) 1) Solve:

$$\cos \sqrt{y} \frac{dy}{dx} = \sqrt{y} x \sin x^2, \quad y(0) = \pi^2.$$

(25 pt) 2) Solve:

$$\frac{dy}{dx} = 2x + \frac{xy}{x^2 - 1}.$$

(30 pt) 3) Give the general solutions of:

a) $y'' - 2y' + y = 0$

b) $y^{(4)} + 4y'' = 0$

(30 pt) 4) Find the general solution of

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

(30 pt) 5) Find the general solution of

$$2x^2 y'' - 8x y' + 8y = x, \quad x > 0$$

(30 pt) 6) Solve using the Laplace transform technique

$$y' + 3y = f(t)$$

$$y(0) = 0$$

where

$$f(t) = \begin{cases} 1, & 0 \leq t < 2 \\ 0, & t \geq 2 \end{cases}$$

(30 pt) 7) Solve the system of differential equations

$$x' = 2x - y$$

$$y' = x + 2y$$