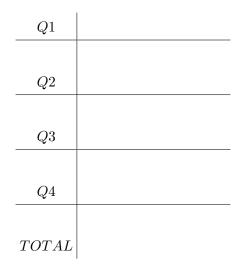
Math 202 - Final (Summer 10) T. Tlas

- Please answer question 4 on the same sheet of paper on which it is written. Questions 1 and 2 have an extra sheet for you to write your answer on it, while question 3 has two extra sheets for this purpose. Any part of your answer written on the wrong page will not be graded.
- There are 4 problems in total. Most questions have several parts. Make sure that you attempt them all.
- This is a closed book exam and no calculators are allowed.

Name :

ID # :

Section Number :



(15 points each) Solve the following IVPs:

i-

$$y' = ye^x \qquad ; \qquad y(0) = 1$$

ii-

$$y' = \frac{1}{\cos(x+2y+3)} - \frac{1}{2}$$
; $y(-3) = 0$

iii-

$$y'' + y = f(t)$$
 ; $y(0) = 0$; $y'(0) = 0$

where

$$f(t) = \begin{cases} 0 & 0 \le t < \pi \\ 1 & \pi \le t < 2\pi \\ 0 & 2\pi \le t \end{cases}$$

iv-

$$y''' - 3y'' + 2y' = 1$$
; $y(0) = 0$; $y'(0) = \frac{1}{2}$; $y''(0) = 2$

ADDITIONAL SHEET FOR PROBLEM 1 ANSWER

(35 points) Find the 10th, 11th, 13th and the 100th coefficients of the series solution (centred at 0) of the following IVP (i.e. find the coefficients of $x^{10}, x^{11}, x^{13}, x^{100}$ of the power series solution of the IVP below)

y'' - 2xy + 8y = 0 ; y(0) = 1 y'(0) = 1

ADDITIONAL SHEET FOR PROBLEM 2 ANSWER

(20 points each) Solve the following IVPs:

i-

$$\dot{\mathbf{X}} = \begin{pmatrix} 1 & -1 & 2 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{pmatrix} \mathbf{X} \qquad ; \qquad \mathbf{X}(0) = \begin{pmatrix} 0 \\ 0 \\ -1 \end{pmatrix}$$

ii-

$$\dot{x} = y + \delta(t - 1)$$
$$\dot{y} = -x$$
$$x(0) = 0 \qquad ; \qquad y(0) = 0$$

ADDITIONAL SHEET FOR PROBLEM 3 ANSWER

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(15 points) Is there a second-order, linear, ordinary differential equation such that both $y_1(x) = 1$ and $y_2(x) = Sin(x)$ are solutions of it? In other words, can you find two functions P(x) and Q(x)such that the equation:

$$y'' + P(x)y' + Q(x)y = 0?$$

has $y_1(x)$ and $y_2(x)$ as its solutions?

If yes, give an example. If no, provide a justification.