

Math 202-172 Quiz 4.

Name \_\_\_\_\_ Section\_\_ Serial #\_\_ Id\_\_\_\_\_

*Quiz will not be graded if you don't write your serial number.*

Q1. (a) Give a recurrence relation for the coefficients of a power series solution  $y = \sum_{n=0}^{\infty} a_n x^n$  of the 3<sup>rd</sup> order differential equation  $y''' - y = 0$ .

(b) Use (a) to solve the IVP  $y(0) = 1, y'(0) = 0, y''(0) = 0$ .

(Remember: If  $y = \sum_{n=0}^{\infty} a_n x^n$  then  $y(0) = a_0$ ,

$y'(0) = a_1, y''(0) = (2!)a_2$  ).

Q2) Classify singular points of

$(x^2 - 9)^2 y'' + (x + 3)y' + 2y = 0$   
as regular or irregular.

Q3:  $A = \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 2 \end{pmatrix}$

a) Find all eigen vectors for the eigen value 2 and give a basis for these eigenvectors.

b) Find all column vectors  $\vec{v} = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$  such that  $(A - 1I)^2 \vec{v} = \vec{0}$  and give a basis of such generalized eigenvectors.

c) Give a fundamental set of solutions of the system  $X' = AX$  from the bases you found in parts (a) and (b).