King Fahd University of Petroleum and Minerals

Quiz 4 Math 202 Semester: 163 Duration: 50 minutes

Full Name: ID:

Section and Serial number:

Q1 Consider the DE: $xy'' - y' + y = 0$.

a) Find the indicial roots of the singular point 0.

b) Find a power series solution about 0 using the largest indicial root.

Q 2 Verify that

$$X = C_1 \mathrm{e}^{-t} \begin{pmatrix} 6 \\ -1 \\ -5 \end{pmatrix} + C_2 \mathrm{e}^{-2t} \begin{pmatrix} -3 \\ 1 \\ 1 \end{pmatrix} + C_3 \mathrm{e}^{3t} \begin{pmatrix} 2 \\ 1 \\ 1 \end{pmatrix} + \begin{pmatrix} t \\ 0 \\ 0 \end{pmatrix}$$

form a general solution of

$$\begin{cases} x_1' &= 6x_2 + 1 \\ x_2' &= x_1 + x_3 - t \\ x_3' &= x_1 + x_2 - t \end{cases}$$

Q 3 Solve

$$X' = \begin{pmatrix} 4 & -5 \\ 1 & 2 \end{pmatrix} X$$

Q 4 Solve $X' = AX$ where

$$A = \begin{bmatrix} 1 & 3 & 7 & 0 \\ 0 & -6 & 5 & 0 \\ 0 & -5 & 4 & 0 \\ 0 & -6 & -14 & 1 \end{bmatrix}$$