ID #:____________ Name:_____________ Quiz 5 (MATH 202) Serial:______

Q1. If $y=\sum_{n=0}^{\infty} c_n x^n$ is a power series solution of the LDE $(1-x^2)y''-2xy'+4y=0$ about the ordinary point $x=0$, find the recurrence relation that determines c_n.

Q.2. (i) Find the indicial equation (without solving the LDE) of the LDE: $xy''-(3-2x^2)y'-\frac{5}{x}y=0$ about the regular singular point $x=0$, and find its roots.

(ii) Considering the roots in (i), state the nature of both series solutions of the above LDE .

Q.3 (i) Find the singular points of of the LDE: $x^3(x^2-25)^2y''+3x^2(x+5)y'+7y=0$.

(ii) Classify each singular point obtained in (i) as regular or irregular. (Show all steps)

Q.4. Setting $y=\sum_{n=0}^{\infty}c_nx^n$ in the LDE $y''-xy'-x^2y=0$ gives us $2c_2+6c_3x-c_1x+\sum_{k=2}^{\infty}[(k+1)(k-1)c_k+(k+2)(k-1)c_{k+2}]x^k=0$.

Find One Power Series solution of the LDE about the Ordinary Point $x=0$.

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Q.1. If $y=\sum_{n=0}^{\infty} c_n x^n$ is a power series solution of the LDE $y''-xy'-x^2y=0$ about the ordinary point $x=0$, find the recurrence relation and other relations that determine all c_n's.

Q.2. (i) Find the singular points of of the LDE: $x^3(x-4)(x-2)^2 y''+3x(x-2)y'+7(x-4)y=0$.

(ii) Classify each singular point obtained in (i) as regular or irregular. (Show all steps)

Q.3. Find the radius of convergence of a power series solution of the LDE about its ordinary point $x = 4$:

$$(x-2)(x^2+9)y'' + xy' - y = 0$$

Q.4. Setting $y = \sum_{n=0}^{\infty} c_n x^{n+r}$ in the LDE $2xy'' + (1+x)y' + y = 0$ gives us

$$x^r \left[r(2r-1)c_0 x^{-1} + \sum_{k=0}^{\infty} [(k+r+1)(2k+2r+1)c_{k+1} + (k+r+1)c_k]x^k \right] = 0.$$

(i) Find the Indical Equation and its roots:

(ii) Find the Recurrence Relation:

(iii) Find the Frobenius solution for the larger root of indicial equation.