MATHEMATICS 202
SECOND SEMESTER, 2004-05
MAKEUP QUIZ II

Time: 70 MINUTES.

Date: April 23, 2005.

Name:————————————————-

ID Number:————————————————

Circle Problem Session Instructor: Dr. A.Lyzzaik, Dr. H. Yamani

Circle Section Number: 13, 14, 15, 16

GRADE:

1.   /4

2.   /8

3.   /8

4.   /6

5.   /6

6.   /10

7.   /8

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Total: /50

1. Use the method of **undetermined coefficients** to find the expected form of a particular solution y_p for the differential equation

$$y'' - 2y' + 5y = e^x \sin 2x.$$

Caution: Need not find y_p explicitly. (4 points)

2. Use the method of **variation of parameters** to find the general solution of the differential equation

$$y'' - 2y' + y = \frac{e^x}{1 + x^2}.$$

(8 points)

3. Solve by the power series method the initial value problem

$$(x - 1)y'' - xy' + y = 0, \quad y(0) = -2, y'(0) = 6.$$

(8 points)

4. Find the general solution of the Bessel-type differential equation

$$\frac{d}{dx}(xy') + \left(x - \frac{4}{x}\right)y = 0; \quad x > 0.$$

(6 points)

5. Use the substitution $x = e^t$ to find the general solution of the differential equation

$$x^3 y''' - 3x^2 y'' + 6xy' - 6y = 3 + \ln x^3; \quad x > 0.$$

(6 points)

6. Find the indicial roots of the differential equation

$$2xy'' - (3 + 2x)y' - y = 0,$$

and derive the recurrence relation of the coefficients of the series solution of the equation associated with the larger indicial root

(4+6=10 points)

7. Answer TRUE (T) or FALSE (F) only:

(a) ——- The differential equation

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

has exactly two power series solution near a regular singular point x_0.

(2 points)

(b) ——- The differential equation

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

has no fundamental set of power series solutions near an ordinary point x_0.

(2 points)

(c) ——- The differential equation

$$(x^3 - 2x^2 - 3x)^2 y'' + (x+1)(x-3)^2(\sin x)y' - (x+1)y = 0$$

has irregular singular points.

(2 points)

(d) ——- The interval of convergence of series solutions of the differential equation

$$(x^3 + x)y'' + xy' + y = 0$$

about the regular singular point $x = 0$ is $]0, 1[$.

(2 points)