Spring 04·

MATHEMATICS 202, QUIZ II
SPRING SEMESTER,APRIL 22, 2003-04
DURATION: 60 Min.

Name: Signature:

Student number:

Grade (1)/8:

Grade (2)/8:

Grade (3)/8:

Grade (4)/8:

Grade (5)/8:

Grade (6)/10:

Total Grade/50:

Answer the following six questions:

1. Find the general solution on $(0, \infty)$ of the differential equation

$$(x+1)y'' - (3x+4)y' + 3y = 0$$

whose one of its solutions is of the form $y_1 = e^{mx}$; need to find m. (8 points)

2. Find the general solution of the differential equation by using the method of undetermined coefficients.

$$y'' + 3y' - 4y = 15e^{x}.$$

(8 Points)

3. Find the general solution of the differential equation on $(0, \infty)$ by using the method of variation of parameters.

$$x^2y'' - 2y = x^2.$$

(8 Points)

4. Find a recurrence relation for the coefficients of the power series solutions of the differential equation

$$(x+1)y'' - 2(x^2+x)y' + 4(x+1)y = 0.$$

about the ordinary point about $x = 0$, then find a solution of your choice.

(8 points)

5. Find the indicial equation and roots of the differential equation, then find the solution associated with the larger indicial root.

$$4xy'' + 2y' - y = 0.$$

(8 points)

6. Circle the only one **TRUE** statement of the following:

(a) The functions $\cos x$, $\sin x$ and $\cos(x + \pi/8)$ are linearly independent on $(-\infty, \infty)$.

(b) If $x_0 \in (a, b)$ is a regular point of the differential equation

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

where P and Q are continuous functions of (a, b), then the equation admits two power series solutions.

(c) By substituting x by e^t, the differential equation

$$x^3y''' - 3x^2y'' + 6xy' - 6y = 0$$

becomes

$$\frac{d^3y}{dt^3} - 6\frac{d^2y}{dt^2} + 11\frac{dy}{dt} - 6y = 0.$$

(d) The initial-value problem

$$a_2(x)y'' + a_1(x)y' + a_0(x)y = g(x); \qquad y(x_0) = y_0, y'(x_0) = y_1,$$

where a_2, a_1 and a_0 are continuous functions of an open interval I containing x_0 and y_0 and y_1 are real numbers, always admits a unique solution.

(e) Functions $y_1, y_2, \cdots, y_n$ defined on an interval (a, b) are linearly independent if and only if their Wronskian $W(y_1, y_2, \ldots, y_n)$ is never zero on (a, b).

(10 points)