Summer 2000

MATHEMATICS 202, QUIZ II
SUMMER SEMESTER,AUGUST 14, 1999-2000
DURATION: 55 MINUTES

Answer the following five questions:

1. (a) Find the general solution on $(0, \infty)$ of the differential equation knowing that the given function is a solution.

$$x^2y'' + xy' + (x^2 - 1/4)y = 0;\ y_1 = \frac{\cos x}{\sqrt{x}}.$$

(b) Let a_0, a_1 and a_2 be continuous functions of the open interval $(-\infty, \infty)$ with $a_2(x) \neq 0 \quad (-1 \leq x \leq 1)$. Can the functions x and $\sin x$ be solutions on $(-\infty, \infty)$ of some differential equation

$$a_2(x)y'' + a_1(x)y' + a_0(x)y = 0?$$

Justify your answer. (5 points each)

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

$$y'' + 4y - 3\sin 2x.$$

(10 points)

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

$$x^2y'' + xy' + y = \sec(\ln x).$$

(10 points)

4. Use the power series method to solve the initial-value problem; write the solution in concise (not power series) form.

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

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

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

(10 points)