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Taken Out

MATHEMATICS 202  
SECOND SEMESTER, 1996-97  
QUIZ 1

Time: 55 MINUTES.

Date: April 7, 1997.

Name: \_\_\_\_\_

ID Number: \_\_\_\_\_

Section: \_\_\_\_\_

Circle Instructor's Name: Prof. H. Abu-Khuzam, Prof. A. Lyzzaik

GRADE:

1.

2.

3.

4.

5.

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Total: /50

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

$$x^2y'' - xy' + y = 5$$

knowing that  $y = x$  is a solution of the associated homogeneous equation.

(10 points)

2. Solve the differential equation

$$(2x + 3y + 1)dx + (4x + 6y + 1)dy = 0.$$

(10 points)

3. Solve the differential equation

$$x^2 y' = [(x/2) + y]^2.$$

(10 points)

4. Let  $y_1$  be a solution on  $(-1, 1)$  of the differential equation

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

where  $P$  and  $Q$  are continuous on  $(-1, 1)$ , satisfying  $y_1(0) = y_1'(0) = 0$ . Show that any other solution  $y_2$  satisfying  $y_2(0) = 0$  must be tangent to the  $x$ -axis at  $x = 0$ ; deduce that  $y_2(x) = y_1(x)$  for all  $x \in (-1, 1)$ .

(8 points)

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

(a) — It is always true that two solutions  $y_1$  and  $y_2$  of the differential equation

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

where  $a_2$ ,  $a_1$  and  $a_0$  are continuous on  $(-\infty, \infty)$  with  $a_2(x) \neq 0$  for all  $x \in (-\infty, \infty)$ , are linearly independent if and only if the equation

$$W(y_1, y_2)(x) = 0$$

has no solution for  $x$  in  $(-\infty, \infty)$ .

(b) — The solution of the initial-value problem

$$(2x \cos y + 3x^2 y)dx + (x^3 - x^2 \sin y - y)dy = 0; y(0) = 2$$

satisfies  $y(1) = \pi/2$ .

(c) — The solution of the initial-value problem

$$y(xy^2 - 1)dx - dy = 0; y(0) = \sqrt{2}$$

satisfies  $y(1/2) = 1$ .

(12 points; 4 points each)