

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Semester II, 2005-2006(052)
MATH 202
Major Exam I
Time: 1 hour 30 minutes

Student Name: _____

Student ID: _____

Section: _____

Note:

FOR ALL PROBLEMS, SHOW WORK. NO CREDIT FOR ANSWERS NOT SUPPORTED BY WORK.

1. Verify that

$$y = e^{2x} \cos 3x$$

is a solution of

$$y'' - 4y' + 13y = 0.$$

2. (a) Find all solutions of the differential equation

$$xy' = y.$$

Verify that each solution is a solution of the IVP

$$xy' = y, \quad y(0) = 0.$$

- (b) Determine a region R in the XY -plane for which the differential equation

$$xy' = y$$

would have a unique solution through a point (x_0, y_0) in the region R .

3. Solve the differential equation

$$\frac{dy}{dx} = \frac{-x^2 - y^2}{2y}$$

by finding an integrating factor for it.

4. (a) Solve the IVP

$$\begin{aligned}\frac{dy}{dx} &= \frac{2x+1}{2y} \\ y(-2) &= -1\end{aligned}$$

(b) Find an interval of definition of the solution in part (a).

5. DO NOT SOLVE the following equations. Just give an appropriate substitution for solving them

(a) $x dy = (y + \sqrt{x^2 - y^2}) dx.$

(b) $\frac{dy}{dx} = y(xy^3 - 1).$

(c) $-y dx + (x + \sqrt{xy}) dy = 0.$

(d) $x \frac{dy}{dx} = y + \sqrt{x^2 - y^2}.$

(e) $\frac{dy}{dx} = \frac{3x + 2y}{3x + 2y + 1}.$