



King Saud University Department of Mathematics

First Midterm Exam

1st semester 1438 H

Course Title: Math 225 (Introduction to Ordinary Differential Equations)

Date: November 2016; (10-11:30) am

(.....) Name ID

Question	Grade
Q1	
Q2	
Q3	
Total	

Q1	(1)	(2)	(3)	(4)	(5)
Answer					

Question 1

Choose the correct answer (write it down on the table above):

- (1) The differential equation $x^3 \frac{d^4 y}{dx^4} + \cos x \left(\frac{dy}{dx}\right)^3 = 5x$ is of
 - (a) order 4 and nonlinear.
 - (b) order 3 and nonlinear
 - (c) order 4 and linear
 - (d) None of the previous.
- (2) The value of k that makes $(3x^2 y + e^y)dx + (x^k + xe^y - 2y)dy = 0$ exact is
 - (a) 2
 - (b) 3
 - (c) -2
 - (d) None of the previous.
- (3) To solve the differential equation $3(1 - t^2) \frac{dy}{dt} + 2ty(y^3 - 1) = 0$ we use the substitution
 - (a) $u = y^{-2}$
 - (b) $u = t^2$
 - (c) $u = y^{-3}$
 - (d) None of the previous.
- (4) The function $f(x, y) = \sqrt{xy^3} \left(\frac{x^2 + xy}{xy^2 + y^3}\right)$ is homogeneous of degree
 - (a) 1
 - (b) -1
 - (c) 2
 - (d) None of the previous.
- (5) The one parameter family of solutions for $dy/dx = e^x y^2$ is $y = \frac{-1}{e^x + c}$. The trivial solution $y=0$ for this differential equation is a
 - (a) particular solution
 - (b) member of the family of solutions
 - (c) singular solution
 - (d) None of the previous.

Question 2

- (a) Find the integrating factor for the following linear differential equation

$$x^2y' + x(x + 2)y = e^x$$

- (b) Determine the region of the xy -plane for which the differential equation has a unique solution

$$\frac{dy}{dx} = x \ln(y + 2)$$

Question 3

(I) Solve the following differential equations:

(a) $\frac{dy}{dx} = 1 + e^{y-x+5}$.

(b) $(x - 2y)dx + (2x - y)dy = 0$

(II) Solve the Initial Value Problem

$$(4xy + 3x^2)dx + (2y + 2x^2)dy = 0, \quad y(1) = 2$$