The Hashemite University Department of Mathematics March 26, 2012
Ordinary Differential Equations (1) First Exam Time: 60 Minutes
Name (in Arabic): _____ Student Number: _____
Section number or lecture time: _____ Instructor name: _____

Question one: Choose the correct answer and fill it in the following table (2 points each)

1	2	3	4	5	6
a	a	a	a	a	a
b	b	b	b	b	b
c	c	c	c	c	c
d	d	d	d	d	d

1. The largest interval on which the following initial value problem has a unique solution is

$$(x-1)\frac{dy}{dx} + \frac{1}{x-2}y = \frac{1}{x-3}, \qquad y(4) = 1.5$$

a. $(1,2)$ b. $(3,\infty)$ c. $(2,3)$ d. $(-\infty,1)$

2. The general solution to $[\sin(x) + \sec^2(x+y)]dx + [\sin(y) + \sec^2(x+y)]dy = 0$ is

a. $-\cos(x) - \cos(y) + \tan(x+y) = c$ b. $\cos(x) - \cos(y) + \tan(x+y) = c$
c. $-\cos(x) + \cos(y) + \tan(x+y) = c$ d. $\cos(x) + \cos(y) - \tan(x+y) = c$

3. The general solution to $\dfrac{dy}{dx} = \dfrac{1}{\sinh(2x+y)} - 2$ is

a. $\sinh(2x+y) - x = c$ b. $\cosh(2x+y) - x = c$
c. $\sinh(2x+y) + x = c$ d. $\cosh(2x+y) + x = c$

4. The following equation can be converted to a homogenous by

$$[x + 2y + 4]dx + [2x + 3y + 7]dy = 0$$

a. $x = u+1, y = v-2$ b. $x = u-1, y = v+2$
c. $x = u-2, y = v-1$ d. $x = u+2, y = v+1$

5. The most general function $N(x,y)$ that makes the following equation exact is given by

$$[2y\cos^2(x) + e^x]dy + N(x,y)dx = 0$$

a. $2y\cos^2(x) + e^x + h(x)$ b. $-y\sin(2x) + e^x y + h(x)$
c. $-2y\sin(2x) + e^x y + h(x)$ d. $-y^2\sin(2x) + e^x y + h(x)$

6. The integrating factor of $(y^2 + 2xy)dx - x^2 dy = 0$ is

a. $\mu(x) = x^2$ b. $\mu(x) = x^{-2}$ c. $\mu(y) = y^2$ d. $\mu(y) = y^{-2}$

Question two : Find the solution to the following equations (2 points each)

(a) $y' = y, \quad y(0) = 3$

(b) $y'' + 10y' + 21y = 0$

(c) $y'' + 10y' + 25y = 0$

(d) $y'' + \omega^2 y = 0$ (where ω is a positive constant)

Question three : Find the general solution to the following equation (5 points)

$$3\frac{dy}{dt} + 2y = e^{3t}y^{-2}$$