American University of Beirut
Math 202-Differential Equations
Spring 2014(N. Nahlus, W. Raji, H. Yamani, M. Kobeissi, K. Aziziheris)
Quiz 1, Time: 60 Minutes

March 1, 2014

Your Name:......................... and ID:...................

PLEASE CIRCLE YOUR SECTION:

Section 1(N. Nahlus), Section 2(N. Nahlus), Section 3(N. Nahlus), Section 4(N. Nahlus), Section 5(N. Nahlus), Section 6(N. Nahlus), Section 7(N. Nahlus), Section 8(N. Nahlus).

Section 9(H. Yamani), Section 10(H. Yamani), Section 11(H. Yamani), Section 12(H. Yamani).

Section 13(M. Kobeissi), Section 14(M. Kobeissi), Section 15(M.Kobeissi), Section 16(M.Kobeissi).

Section 17(K. Aziziheris), Section 18(K. Aziziheris), Section 19(K. Aziziheris).

Section 20(W. Raji), Section 21(W. Raji), Section 22(W. Raji), Section 23(W. Raji).

Grades:

1/15	2/15	3/20	4/10	5/10	6/15	7/15	Total/100

Notes:

- **Calculators are not allowed.**

Problem 1. (15 pts) Use Divergence Theorem to find the outward flux

$$\int\int_S \overrightarrow{F} \cdot \overrightarrow{n}\, d\sigma$$

of the vector field

$$\overrightarrow{F} = \langle 5x, 2y, 8z \rangle$$

across the sphere $\rho = 2$.

Problem 2. (15 pts) Let $\overrightarrow{F} = \langle 5y, 8x, z\rangle$ **and** S **be the paraboloid**

$$z = 4 - x^2 - y^2, \; z \geq 0$$

which is open at the bottom. Find

$$\int\int_S \overrightarrow{F} \cdot \overrightarrow{n}\, d\sigma,$$

(where $\overrightarrow{n}$ **is the outer normal vector to our surface) by using Divergence Theorem.**

Problem 3. Let S be the upper spherical cap formed by cutting the sphere $x^2+y^2+z^2=2$ with a cone having the equation $z=\sqrt{x^2+y^2}$. Answer the following questions:

1. (10 pts) Let C denote the boundary of the surface (the cap) S and let

$$\overrightarrow{F}=(z-y)\,\overrightarrow{i}+y\,\overrightarrow{k}.$$

   Calculate the circulation of $\overrightarrow{F}$ around the curve C counter clockwise by parameterizing the curve C.

2. (10 pts) Solve part 1 by using Stokes' Theorem.

Problem 4. (10 pts) Solve the IVP:

$$x\frac{dy}{dx} - 2y = x^3 + 3, \;\; y(1) = 2.$$

Problem 5. (10 pts) Solve the DE:

$$\frac{e^{-y+x}}{x-1} \cdot \frac{dy}{dx} + e^{x^2-x} = 0.$$

Problem 6. (15 pts) Solve the DE:

$$(3x + 1/2)y^2 \frac{dy}{dx} + \frac{3}{2x^2} + y^3 = 0.$$

Problem 7. (15 pts) Multiply both sides of the differential equation by an appropriate factor to make it exact. Then Solve it:

$$(3xy^2 + 2x^2y)dy + (2y^3 + 3xy^2)dx = 0.$$