KOÇ UNIVERSITY

MATH 203 - MULTIVARIABLE CALCULUS
Mid Term 1   March 18, 2017
Duration of Exam:90 minutes

INSTRUCTIONS: You can NOT use calculators in the exam. No books, no notes, and no talking allowed. You must always **explain your answers** and **show your work** to receive **full credit**. Use the back of these pages if necessary. **Print (use CAPITAL LETTERS) and sign your name, and indicate your section below.**

Name: ───────────────────

Surname: ───────────────────

Signature: ───────────────────

Instructor (Check One):

Varga Kalantarov   ──

Ayberk Zeytin   ──

PROBLEM	POINTS	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
TOTAL	**100**	

1. (20 points) Let L be the line that passes through the origin and parallel to the line of intersection of the planes

$$x + 2y - z = 2 \quad \text{and} \quad 2x - y + 4z = 5.$$

Write an equation of L.

2. (20 points) Compute the following limits if exists, else show that the limit does not exist:

(a) $\displaystyle\lim_{(x,y)\longrightarrow(0,0)} \frac{xy^2}{\sqrt{x^2+y^2}}$

(b) $\displaystyle\lim_{(x,y)\longrightarrow(0,0)} \frac{\sin(\sqrt{x^2+y^2})}{x^2+y^2}$

(c) $\displaystyle\lim_{(x,y)\longrightarrow(0,0)} \frac{x^3y}{2x^6+y^2}$

3. (20 points) Given

$$f(x, y, z) = \frac{1}{\sqrt{x^2 + y^2 + z^2}},$$

calculate

$$f_{11}(x, y, z) + f_{22}(x, y, z) + f_{33}(x, y, z).$$

4. (20 points) (a) Use the definition of differentiability to show that if f is differentiable at some point (a, b) in its domain, then f is continuous at (a, b).

(b) Is the function $f(x, y) = \sin(\sqrt{x^2 + y^2})$ differentiable at $(0, 0)$? Why?

5. (20 points) Find an equation of the tangent plane AND normal line to the surface

$$z \sin(x + y^2) - 2x^2 + e^z = 0$$

at the point $(-1, 1, \ln(2))$.