Philadelphia University
Department of Basic Sciences and Mathematics

Academic Year:	2016–2017	**Course Name:**	Linear Programming
Semester:	Summer Semester	**Course Number:**	250373
Exam:	First Exam	**Instructor Name:**	Feras Awad
Exam Date:	02/08/2017	**Student Name:**	________
Exam Day:	Wednesday	**University ID:**	________
Exam Mark:	[20]	**Serial:**	________

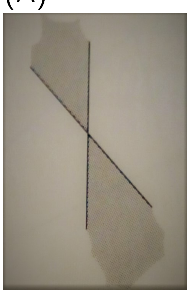
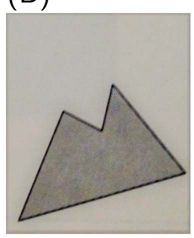
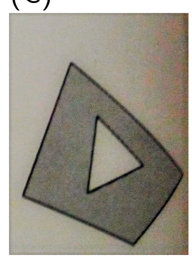
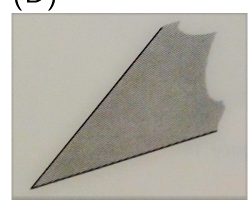
Question ONE : Write the symbol of the correct answer in the **blank** beside the question number.

1. [   ] Which of the following is a **half-space** in $\mathbb{R}^3$?

   (A) $5x_1 - 7x_2 + x_3 + 11x_4 \le 1$ (B) $2x_1 - 3x_2 + x_3 = 7$

   (C) $2x_1 - 3x_2 + x_3 \ge 7$ (D) $5x_1 - 7x_2 + x_3 + 11x_4 = 1$

2. [   ] Which of the following sets is **CONVEX** ?

   (A)
   
   (B)
   
   (C)
   
   (D)
   

3. [   ] **Infeasibility** means that the number of solutions to the linear programming models that satisfies all constraints is

   (A) at most 1   (B) 0   (C) infinite   (D) at least 2

4. [   ] The **direction of increase** in z when we maximize $z = x_1 - x_2$ is

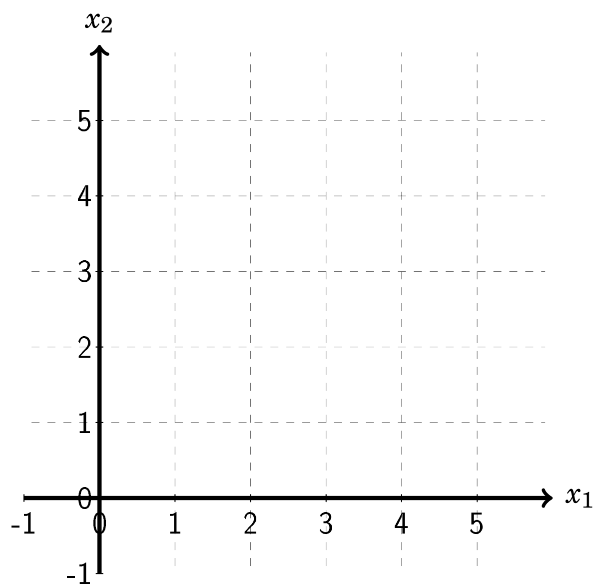
   (A) up-left   (B) down-right   (C) down-left   (D) up-right

5. [   ] The **line segment** in $\mathbb{R}^2$ joining the points $\mathbf{p} = (1,2)$ and $\mathbf{q} = (2,4)$, given that $0 \le t \le 1$, is

   (A) $(1+t, 2+2t)$ (B) $(1+3t, 2+t)$ (C) $(1+2t, 2+t)$ (D) $(1+2t, 2+2t)$

Question TWO : Solve the following LP problem **graphically**.

$$\begin{aligned} \text{Maximize} \quad & z = 120x_1 + 100x_2 \\ \text{Subject to} \quad & x_1 + x_2 \le 4 \\ & 5x_1 + 3x_2 \le 15 \\ & x_1, x_2 \ge 0 \end{aligned}$$



Question THREE : Solve the following LP problem using the **Simplex Algorithm**.

$$
\begin{array}{rl}
\text{Maximize} & z = 5x_1 + 2x_2 \\
\text{Subject to} & 2x_1 + x_2 \le 4 \\
 & -x_1 + 3x_2 \le 6 \\
 & x_1,\, x_2 \ge 0
\end{array}
$$

z		RHS
Row 0		

z		RHS
Row 0		

z		RHS
Row 0		

z		RHS
Row 0		

Question FOUR : **Without** using the **Simplex Method**, solve the LP problem given by

$$\begin{aligned} \text{Maximize} \quad & z = 5x_1 - 6x_2 + 3x_3 - 5x_4 + 12x_5 \\ \text{Subject to} \quad & x_1 + 3x_2 + 5x_3 + 6x_4 + 3x_5 \le 90 \\ & x_1,\, x_2,\, x_3,\, x_4,\, x_5 \ge 0 \end{aligned}$$

[**HINT**: **What are the BASIC and NONBASIC variables of this problem ?**]