**EASTERN MEDITERRANEAN UNIVERSITY**

 **Department of Industrial Engineering**

**IENG511 Optimization Theory**

**HOMEWORK 2 Spring 2017-18**

1. Consider the problem:

Min **cx**

*St.* **Axb**

 **x0**

In each of the following case answer to these questions,

What happens to the feasible region? What happens to the optimal objective?

1. One component of the vector **b**, say *bi* is increased by one unit to *bi+1*.
2. A new constraint, *m+1* is added to the problem.
3. A new variable, *n+1* is added to the problem.
4. A constraint, say constraint *i* is deleted from the problem.
5. A variable say, *xk* is deleted from the problem.
6. Consider the following linear programming problem



1. Sketch the feasible region in the *(x1,x2)* space and find the extreme points.
2. Identify the optimal solution by computing the value of objective function in each extreme point.
3. Suppose that the fourth constraint is dropped. Solve the resulting problem and interpret the solution.
4. Suppose that the objective function change as *-4x1+2x2*, what will happen for optimal solution?
5. Consider the following linear programming problem



1. Sketch the feasible region in the *(x1,x2)* space and identify the optimal solution. (10 points)
2. If the RHS of the last constraint change from 9 to 12 what will happen for feasible region and optimal solution? (5 points)
3. Consider the set $=\{\left(x\_{1},x\_{2}\right):x\_{1}+x\_{2}\geq 2, 2x\_{2}\leq 8, x\_{1},x\_{2}\geq 0\}$ . Find a hyperplane H such that X and the point (3,-2) are on the different sides of the hyperplane. Write the equation of the hyperplane.
4. Show that if C is a convex cone, then C has at most one extreme point namely the origin.
5. Let $a\_{1}=\left(\genfrac{}{}{0pt}{}{1}{0}\right), a\_{2}=\left(\genfrac{}{}{0pt}{}{2}{3}\right), a\_{1}=\left(\genfrac{}{}{0pt}{}{-1}{4}\right), a\_{1}=\left(\genfrac{}{}{0pt}{}{5}{-3}\right)$ and $a\_{5}=\left(\genfrac{}{}{0pt}{}{-4}{3}\right)$. Illustrate geometrically the collection of all convex combinations of these five vectors.
6. Draw given convex set. Find all of its extreme points and if recessions directions are exist draw the polyhedral cone which contains all of them. Find all extreme directions.

