Homework 05 – Optimization

1) Problem 4.1-1

Consider the following problem:

Maximize	$Z = x_1 + 2x_2$
Subject to:	$x_1 \le 2$
	$x_2 \le 2$
	$x_1 + x_2 \le 3$
And	$x_1 \ge 0, x_2 \ge 0$

a. Plot the feasible region and circle all CPF solutions.

b. For each CPF solution, identify the pair of constraint boundary equations that it satisfies.

c. For each CPF solution, use this pair of constraints to solve algebraically for the values of x_1 and x_2 at the corner points.

d. For each CPF solution, identify its adjacent CFP solutions

e. For each pair of adjacent CPF solutions, identify the constraint boundary they share by giving its equation.

2) Problem 5.1-1

Consider the following problem:

Maximize	$Z = 3x_1 + 2x_2$
Subject to:	$2x_1 + x_2 \le 6$
	$x_1 + 2x_2 \le 6$
And	$x_1 \ge 0, x_2 \ge 0$

a. Solve this problem graphically. Identify the CPF Solutions by circling them on graph.

b. Identify all sets of two defining equations for this problem. For each set, solve (if a solution exists) for the corresponding corner-point solution, and classify it as a CPF solution or corner-point infeasible solution.

c. Introduce slack variables in order to write the functional constraints in augmented form. Use these slack variables to identify the basic solution that corresponds to each corner-point solution found in part (b)

d. Do the following for each set of two defining equations from part (b):
   i. Identify the indicating variable for each defining equation.
   ii. Display the set of equations from part (c) after deleting these two indicating (non-basic) variables.
   iii. Use these equations to solve for the two remaining variables (the basic variables).
   iv. Compare the resulting basic solution to the corresponding basic solution obtained in part (c).

e. Without executing the simplex method, use its geometric interpretation (and the objective function) to identify the path (sequence of CPF solutions) it would follow to reach the optimal solution. For each of these CPF solutions in turn, identify the following decisions being made for the next iteration:
   i. Which defining equation is being deleted and which is being added
   ii. Which indicating variable is being deleted (the entering basic variable) and which is being added (the leaving basic variable).