**Advanced Quantitative Business Analysis**

**Homework # 1**

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| **Sr. #** | **Student Name** | **Student ID** |
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**Question 1:** The dean of the Western College of Business must plan the school’s course offerings for Fall semester. Student demands make it necessary to offer at least 30 undergraduate and 20 graduate courses in the term. Faculty contracts also dictate that at least 60 courses be offered in total. Each undergraduate course taught costs the college an average of $2,500 in faculty wages, and each graduate course costs $3,000. How many undergraduate and graduate courses should be taught in the fall so that total faculty salaries are kept to a minimum? Use graphical LP approach to solve the problem.

**Question 2:** The Outdoor Furniture Corporation manufactures two products, benches and picnic tables, for use in yards and parks. The firm has two main resources: its carpenters (labor force) and a supply of redwood for use in the furniture. During the next production cycle, 1,200 hours of labor are available under a union agreement. The firm also has a stock of 3,500 feet of good-quality redwood. Each bench that Outdoor Furniture produces requires 4 labor hours and 10 feet of redwood; each picnic table takes 6 labor hours and 35 feet of redwood. Completed benches will yield a profit of $9 each, and tables will result in a profit of $20 each. How many benches and tables should Outdoor Furniture produce to obtain the largest possible profit? Use the graphical LP approach to solve the problem.

**Question 3:** Consider the following LP problem:

**𝑀𝑎𝑥𝑖𝑚𝑖𝑧𝑒 𝑃𝑟𝑜𝑓𝑖𝑡 = 5𝑋 + 6𝑌**

2𝑋 + 𝑌 ≤ 120

2𝑋 + 3𝑌 ≤ 240

𝑋, 𝑌 ≥ 0

(a) What is the optimal solution to this problem? Solve it graphically.

(b) If a technical breakthrough occurred that raised the profit per unit of X to $8, would this affect the optimal solution?

(c) Instead of an increase in the profit coefficient X to $8, suppose that profit was overestimated and should only have been $3. Does this change the optimal solution?