

§6.1: GRAPHICAL INTRODUCTION TO SENSITIVITY ANALYSIS

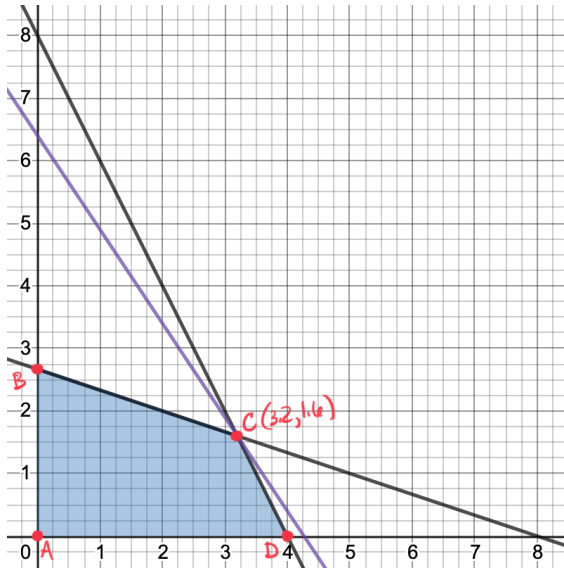
- 1.] JOBCO manufactures two products on two machines. A unit of product 1 requires 2 hrs on machine 1 and 1 hr on machine 2. For product 2, one unit requires 1 hr on machine 1 and 3 hrs on machine 2. The revenues per unit of products 1 and 2 are \$30 and \$20 respectively. The total daily processing time available for each machine is 8 hrs. The LP and the feasible region with optimal solution are provided below.

$$\text{Maximize: } z = 30x_1 + 20x_2$$

$$\text{Subject to: } 2x_1 + x_2 \leq 8$$

$$x_1 + 3x_2 \leq 8$$

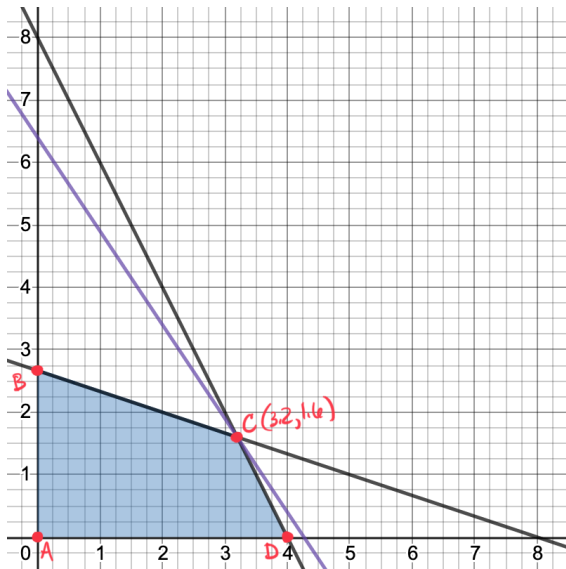
$$x_1, x_2 \geq 0$$



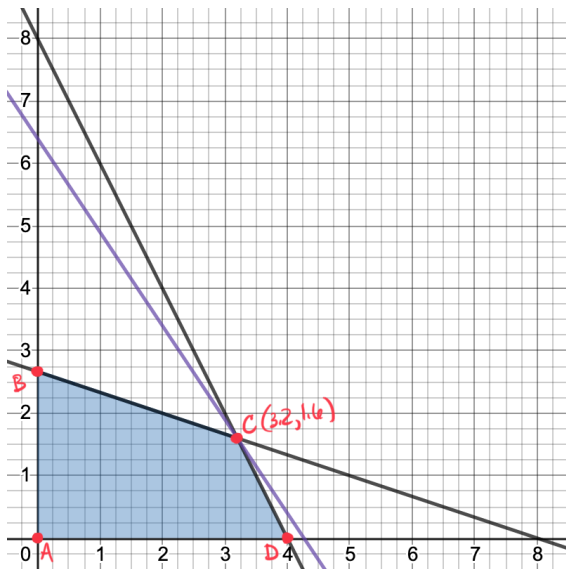
- a.) Write down the slope of the objective function and the two constraints.

- b.) Suppose the revenue per unit of product 1 is c_1 making the objective function $z = c_1x_1 + 20x_2$. For what values of c_1 will the point $(3.2, 1.6)$ still be optimal?

- c.) Suppose $z = c_1x_1 + c_2x_2$. Find the optimality range for the ratio c_1/c_2 . If $c_1 = 35$ and $c_2 = 25$, is $(3.2, 1.6)$ still optimal? What is the new value of z ?



- c.) Suppose changes are made in machine 1 hour capacity. Redefine the first constraint to be $2x_1 + x_2 \leq b_1$. Determine the feasibility range of b_1 that will still yield the same set of optimal basic variables.



- d.) Suppose changes are made in machine 2 hour capacity. Redefine the second constraint to be $x_1 + 3x_2 \leq b_2$. Determine the feasibility range of b_2 that will still yield the same set of optimal basic variables.

- e.) What are the shadow prices for machine 1 hour capacity?