MHN502E OPERATIONS RESEARCH
SOLUTIONS TO MIDTERM EXAM QUESTIONS

1. Dakota problem

a. (6 pts.) The increase at the obj. fn. coef. of the table is \$3, allowable increase is \$5. Therefore, the current basis remains optimal, the profit is still \$280 as no table is produced.

b. (6 pts.) The increase at the obj. fn. coef. of the chair is \$3, allowable increase is \$2.5. Therefore, the current basis is no longer optimal.

c. (6 pts.) The decrease at the obj. fn. coef. of the desk is \$3, allowable decrease is \$4. Therefore, the current basis remains optimal, new profit = 280 + (-3) x 2 = \$274

d. (6 pts.) The decrease at the RHS of carpentry is 3 hrs., allowable decrease is 1.3333 hrs. Therefore, the current basis is no longer optimal.

e. (6 pts.) The increase at the RHS of carpentry is 2 hrs., allowable increase is 2 hrs. Therefore, the current basis remains optimal, new profit = 280 + 2 x 10 = \$300

f. (6 pts.) The decrease at the RHS of lumber is 3 bf, allowable decrease is 24 bf. Therefore, the current basis remains optimal, new profit is still \$280 as the constraint is non-binding.

2. SJT Problem

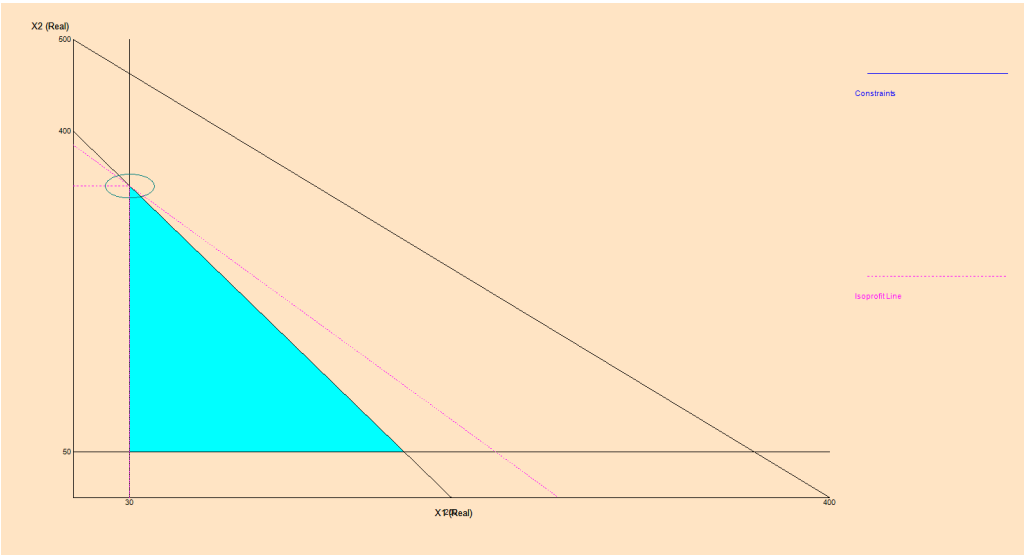
(4 pts.) Decision variables:

x_i: number of P_is manufactured per month

(5 pts.) Objective fn.; (12 pts.) Constraints; (3 pts.) Sign restrictions:

$$\max z = 150\, x_1 + 100\, x_2$$
$$\text{s.t.} \quad x_1 \geq 30$$
$$x_2 \geq 50$$
$$25\, x_1 + 20\, x_2 \leq 10{,}000$$
$$10\, x_1 + 5x_2 \leq 2{,}000$$
$$x_1, x_2 \geq 0$$

(15 pts.) Graphical sol'n:



Opt. sol'n: $x_1 = 30$, $x_2 = 340$, $z = 38500$

(15 pts.) Software output (report)

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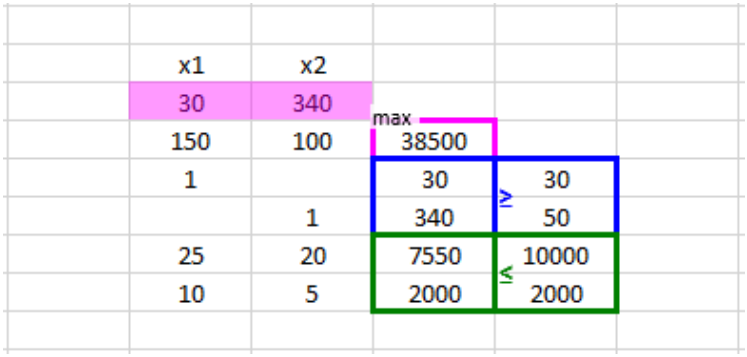
     OBJECTIVE FUNCTION VALUE
          1)       38500.00

  VARIABLE         VALUE          REDUCED COST
        X1          30.000000          0.000000
        X2         340.000000          0.000000

       ROW    SLACK OR SURPLUS      DUAL PRICES
         2)          0.000000        -50.000000
         3)        290.000000          0.000000
         4)       2450.000000          0.000000
         5)          0.000000         20.000000
 NO. ITERATIONS=         2
```

OR



(10 pts.) Executive summary:

SJT should manufacture 30 units of P_1s and 340 units of P_2s per month. In this case, the monthly profit would be $38,500.