Week 6: Assignment. Deadline to be 2nd May at 11:59PM

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1. Graphical Method (2 variables)

Question:
A small workshop makes two types of furniture: chairs and tables.
Each chair requires 2 hours of carpentry and 1 hour of painting.
Each table requires 1 hour of carpentry and 1 hour of painting.
The workshop has 6 hours of carpentry time and 4 hours of painting time available each day.
Each chair gives a profit of $30, and each table gives a profit of $20.

Task:

- Formulate the problem as a linear program.
- Plot the feasible region and determine the optimal number of chairs and tables to maximize profit using a graphical method.

2. Simplex Algorithm (via scipy.optimize.linprog)

Question:
A factory produces 3 products: A, B, and C.
Each requires machine hours on 2 machines: M1 and M2.

Product	Profit	M1 Hours	M2 Hours
A	$40	2	1
B	$30	1	2
C	$20	1	1

- M1 is available for 100 hours/week.
- M2 is available for 80 hours/week.

Task:

- Formulate and solve using the **Simplex algorithm** via scipy.optimize.linprog.
- Determine how many units of A, B, and C to produce to maximize profit.

3. Transportation Method – Northwest Corner Rule (manual or pandas/numpy)

Question:
A company has 3 factories (S1, S2, S3) and 4 distribution centers (D1, D2, D3, D4).

Supplies:

- S1: 30 units
- S2: 40 units
- S3: 20 units

Demands:

- D1: 20 units
- D2: 30 units
- D3: 25 units
- D4: 15 units

Cost Matrix:

	D1	**D2**	**D3**	**D4**
S1	8	6	10	9
S2	9	7	4	2
S3	3	4	2	5

Task:

- Use the **Northwest Corner Method** to construct an initial feasible solution manually or via a custom function in Python.
- Display the allocation matrix and compute the total transportation cost.