ODS quize

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Q. Solve the following simplex method.

$$\max \; 2x+3y$$
$$\text{s.t.} \quad x+2y \leq 2$$
$$y-x \geq 1$$
$$x, y \geq 0$$

→ step 1: Convert to standard form

subject to

$$x+2y \leq 2$$
$$y-x \geq 1$$
$$x, y \geq 0$$

rewrite constraints as ≤ inequalities.

$$x+2y \leq 2$$
$$-y+x \leq -1$$

Introduce slack variable

$$x+2y+s_1 = 2 \quad (\text{where } s_1 \geq 0)$$
$$x-y+s_2 = -1 \quad (\text{where } s_2 \geq 0)$$

step 2: Set up initial simplex tableau:

Basic	x	y	s_1	s_2	RHS
s_1	1	2	1	0	2
s_2	1	−1	0	1	−1
z	−2	−3	0	0	0

step 3: First Iteration:

- entering variable y most negative coefficient −3
- leaving variable s_1 (minimum ratio: 2/2 = 1)

Now dividing first row by 2

Basic	x	y	S_1	S_2	RHS
y	1/2	1	1/2	0	1
S_2	1	-1	0	1	-1
z	-2	-3	0	0	0

Now eliminate y from row)

y	1/2	1	1/2	0	1
S_2	3/2	0	1/2	1	0
z	-1/2	0	3/2	0	3

Step 2: Second Iteration

- entering variable: x (coefficient -1/2 in objective row)
- leaving variable since S_2 row has RH=0, we need $x \geq 0, x = 0$

Basics	x	y	S_1	S_2	RHS
x	0	1	1/3	-1/3	1
y	1	0	1/3	2/3	0
z	0	0	5/3	1/3	3

All coefficient in the objective row are non-negative

step 5: determine final solution

$x = 0$

$y = 1$

maximum $z = 3$

verification:

1. $x + 2y = 0 + 2(1) = 2 \leq 2$ ✓
2. $y - x = 1 - 0 = 1 \geq 1$ ✓
3. $x, y \geq 0$ ✓