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Cycling of the Simplex Method
(Beale 1955)

$$
(LP)\qquad
\begin{array}{lrcrcrcrcrcrcl}
\min & -\frac{3}{4}x_1 & + & 20x_2 & - & \frac{1}{2}x_3 & + & 6x_4 & & & & & & \\
\text{s.t.} & \frac{1}{4}x_1 & - & 8x_2 & - & x_3 & + & 9x_4 & + & x_5 & & & = & 0 \\
 & \frac{1}{2}x_1 & - & 12x_2 & - & \frac{1}{2}x_3 & + & 3x_4 & & & + & x_6 & = & 0 \\
 & & & & & x_3 & & & & & & & = & 1 \\
 & & & & & & & & & & & x_1,\ldots,x_7 & \geq & 0
\end{array}
$$

Choose the basis $B = \{5, 6, 7\}$ and apply the simplex method (Alg. 2.15) with the following rules:
Step 3: Choose the non-basic variable with the smallest value $\bar{c}_j < 0$.
Step 5: Choose the basic variable (according to the quotient rule) with the smallest index.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	
$-3/4$	20	$-1/2$	6	0	0	0	0
$\boxed{1/4}$	-8	-1	9	1	0	0	0
$1/2$	-12	$-1/2$	3	0	1	0	0
0	0	1	0	0	0	1	1

0	-4	$-7/2$	33	3	0	0	0
1	-32	-4	36	4	0	0	0
0	$\boxed{4}$	3/2	-15	-2	1	0	0
0	0	1	0	0	0	1	1

0	0	-2	18	1	1	0	0
1	0	$\boxed{8}$	-84	-12	8	0	0
0	1	3/8	$-15/4$	$-1/2$	1/4	0	0
0	0	1	0	0	0	1	1

1/4	0	0	-3	-2	3	0	0
1/8	0	1	$-21/2$	$-3/2$	1	0	0
$-3/64$	1	0	$\boxed{3/16}$	1/16	$-1/8$	0	0
$-1/8$	0	0	21/2	3/2	-1	1	1

$-1/2$	16	0	0	-1	1	0	0
$-5/2$	56	1	0	$\boxed{2}$	-6	0	0
$-1/4$	16/3	0	1	1/3	$-2/3$	0	0
5/2	-56	0	0	-2	6	1	1

$-7/4$	44	1/2	0	0	-2	0	0
$-5/4$	28	1/2	0	1	-3	0	0
1/6	-4	$-1/6$	1	0	$\boxed{1/3}$	0	0
0	0	1	0	0	0	1	1

$-3/4$	20	$-1/2$	6	0	0	0	0
$\boxed{1/4}$	-8	-1	9	1	0	0	0
1/2	-12	$-1/2$	3	0	1	0	0
0	0	1	0	0	0	1	1