Since
$$1A^3 + 3A^4 + 2A^5 = Au_0 = b,$$
for any $\theta \in \mathbb{R}$, we have
$$\begin{aligned}b &= 1A^3 + 3A^4 + 2A^5 - \theta A^1 + \theta A^1\\ &= 1A^3 + 3A^4 + 2A^5 - \theta(-A^3 + A^4) + \theta A^1\\ &= \theta A^1 + (1+\theta)A^3 + (3-\theta)A^4 + 2A^5,\end{aligned}$$
and
$$\begin{aligned}b &= 1A^3 + 3A^4 + 2A^5 - \theta A^2 + \theta A^2\\ &= 1A^3 + 3A^4 + 2A^5 - \theta(A^3 + A^5) + \theta A^2\\ &= \theta A^2 + (1-\theta)A^3 + 3A^4 + (2-\theta)A^5.\end{aligned}$$

In the first case, the vector $(\theta, 0, 1+\theta, 3-\theta, 2)$ is a feasible solution iff $0 \leq \theta \leq 3$, and the new value of the objective function is θ.

In the second case, the vector $(0, \theta, 1-\theta, 3, 2-\theta, 1)$ is a feasible solution iff $0 \leq \theta \leq 1$, and the new value of the objective function is also θ.

Consider the first case. It is natural to ask whether we can get another vertex and increase the objective function by setting to zero one of the coordinates of $(\theta, 0, 1+\theta, 3-\theta, 2)$, in this case the fouth one, by picking $\theta = 3$. This yields the feasible solution $(3, 0, 4, 0, 2)$, which corresponds to the basis (A^1, A^3, A^5), and so is indeed a basic feasible solution, with an improved value of the objective function equal to 3. Note that A^4 *left* the basis (A^3, A^4, A^5) and A^1 *entered* the new basis (A^1, A^3, A^5).

We can now express A^2 and A^4 in terms of the basis (A^1, A^3, A^5), which is easy to do since we already have A^1 and A^2 in term of (A^3, A^4, A^5), and A^1 and A^4 are swapped. Such a step is called a *pivoting step*. We obtain
$$\begin{aligned}A^2 &= A^3 + A^5\\ A^4 &= A^1 + A^3.\end{aligned}$$
Then we repeat the process with $u_1 = (3, 0, 4, 0, 2)$ and the basis (A^1, A^3, A^5). We have
$$\begin{aligned}b &= 3A^1 + 4A^3 + 2A^5 - \theta A^2 + \theta A^2\\ &= 3A^1 + 4A^3 + 2A^5 - \theta(A^3 + A^5) + \theta A^2\\ &= 3A^1 + \theta A^2 + (4-\theta)A^3 + (2-\theta)A^5,\end{aligned}$$
and
$$\begin{aligned}b &= 3A^1 + 4A^3 + 2A^5 - \theta A^4 + \theta A^4\\ &= 3A^1 + 4A^3 + 2A^5 - \theta(A^1 + A^3) + \theta A^4\\ &= (3-\theta)A^1 + (4-\theta)A^3 + \theta A^4 + 2A^5.\end{aligned}$$