Property Demonstration on the Linear Programming Packages with Various Examples

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Recent Research Topic: Generative Model

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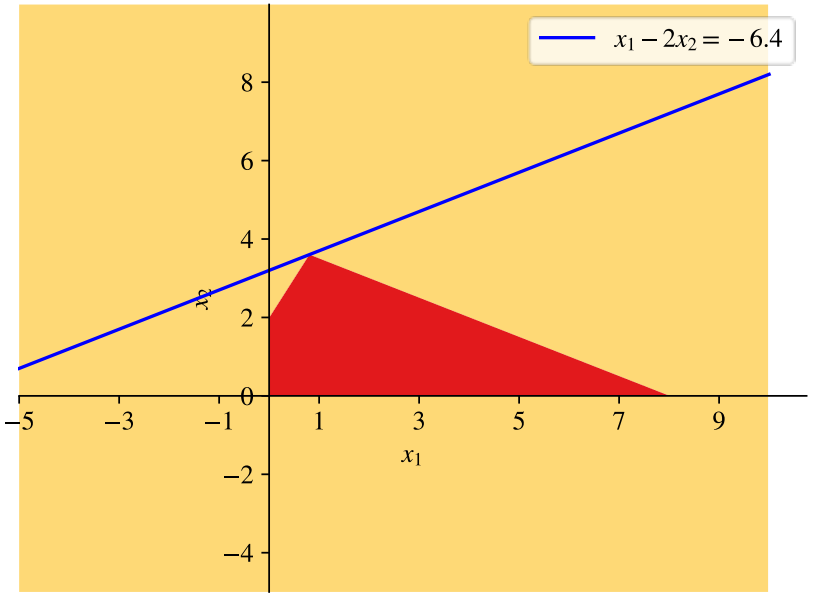
Task 10-1

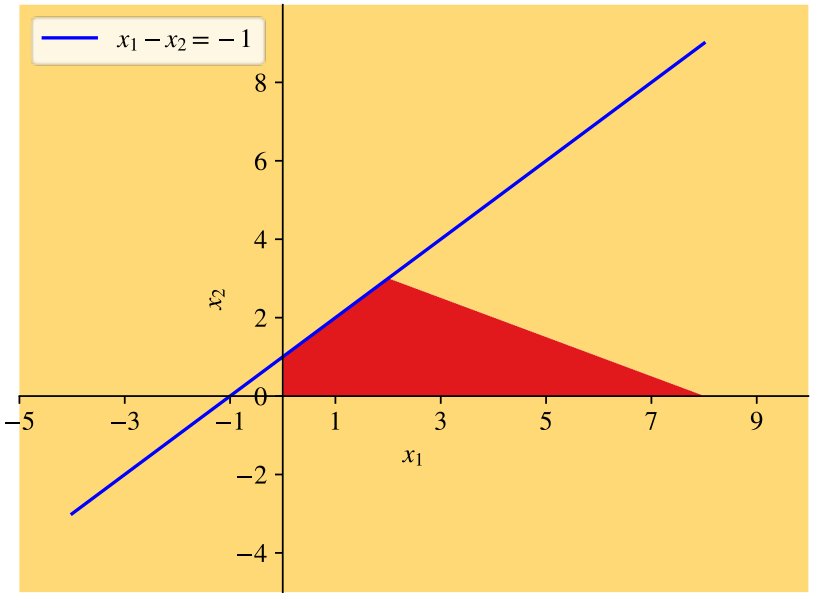
$$\max_x \begin{bmatrix} -1 \\ 2 \end{bmatrix}^\top x$$
$$\text{s.t.} \begin{cases} \begin{bmatrix} -2 & 1 \\ 1 & 2 \end{bmatrix} x \leq \begin{bmatrix} 2 \\ 8 \end{bmatrix} \\ x \geq 0 \end{cases}$$

Package	Solution	Optimal
scipy	(0.8,3.6)	6.4
pulp	(0.8,3.6)	6.4



$$\max_x \begin{bmatrix} -1 \\ 1 \end{bmatrix}^\top x$$
$$\text{s.t.} \begin{cases} \begin{bmatrix} -1 & 1 \\ 1 & 2 \end{bmatrix} x \leq \begin{bmatrix} 1 \\ 8 \end{bmatrix} \\ x \geq 0 \end{cases}$$

Package	Solution	Optimal
scipy	(0, 1)	1
pulp	(0,1)	1



[1] Huangfu, Q., & Hall, J. J. (2018). Parallelizing the dual revised simplex method. Mathematical Programming Computation, 10(1), 119-142.

[2] Forrest, J., Ralphs, T., Santos, H. G., Vigerske, S., Hafer, L., Kristjansson, B., ... & MATSUSHIMA, F. (2023). coin-or/Cbc: Release releases/2.10.11 (releases/2.10.11). Zenodo. https://doi.org/10.5281/zenodo.10041724

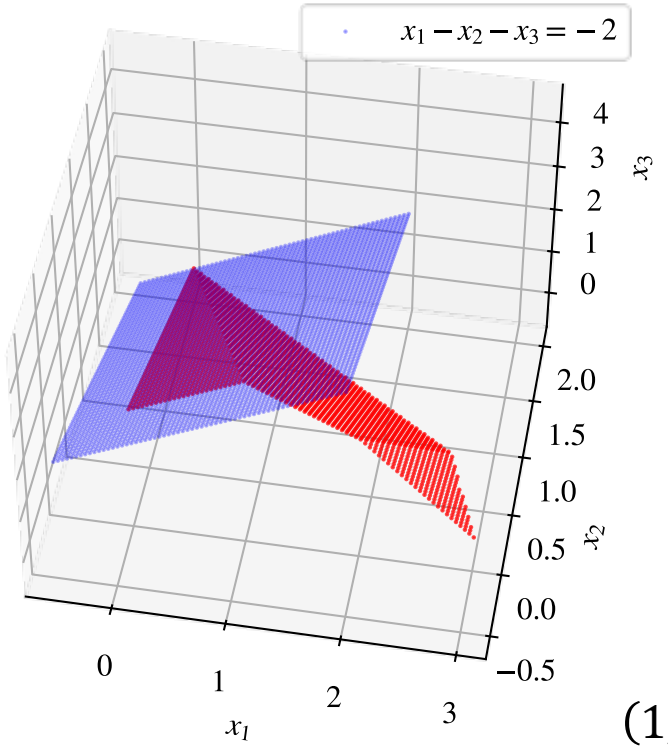
Package	Algorithm
scipy	HiGHS[1]
pulp	Cbc[2]

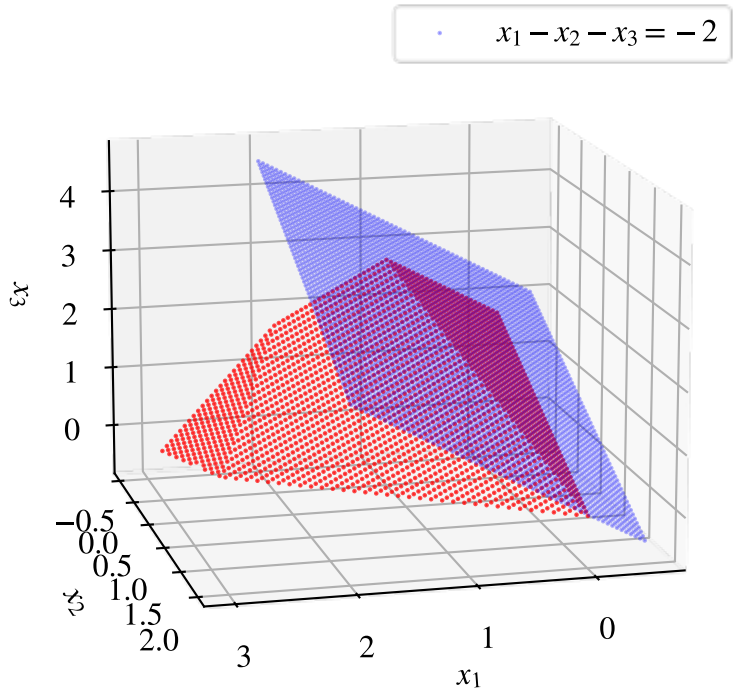
Task 10-1

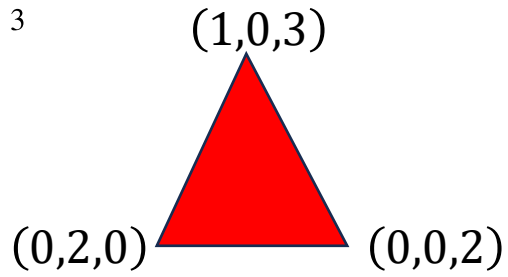
$$\max_x \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}^T x$$

$$\text{s.t.} \begin{cases} \begin{bmatrix} -1 & 1 & 1 \\ 1 & 2 & 1 \\ 2 & 1 & 1 \end{bmatrix} x \leq \begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix} \\ x \geq 0 \end{cases}$$

Package	Solution	Optimal
scipy	(0,0,2)	2
pulp	(0,0,2)	2







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Package	Algorithm
scipy	HiGHS[1]
pulp	Cbc[2]

Task 10-2

Instances	scipy		pulp		$\|\Delta x^*\|$
	time	optimal	time	optimal	
small	1.967×10^{-3}	8106.530114360896	8.827×10^{-3}	8106.530178699999	4.750×10^{0}
medium	5.431×10^{0}	5653427.100619743	1.310×10^{1}	5653427.119371	2.019×10^{-4}
large	1.365×10^{2}	54087865.84468825	3.871×10^{2}	54087865.929	1.013×10^{-3}

[1] Huangfu, Q., & Hall, J. J. (2018). Parallelizing the dual revised simplex method. Mathematical Programming Computation, 10(1), 119-142.
[2] Forrest, J., Ralphs, T., Santos, H. G., Vigerske, S., Hafer, L., Kristjansson, B., ... & MATSUSHIMA, F. (2023). coin-or/Cbc: Release releases/2.10.11 (releases/2.10.11). Zenodo. https://doi.org/10.5281/zenodo.10041724

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