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Degenerate solution in linear programming

How can I determine if a solution in a linear programming problem is degenerate without I use any software or the graphical display of the solution; For example in the model:

$$\max\{2x_1 + 4x_2\}$$
$$\text{s.t.}$$
$$\begin{aligned} x_1 + 2x_2 &\leq 5 \\ x_1 + x_2 &\leq 4 \\ x_1 &\geq 0 \\ x_2 &\geq 0 \end{aligned}$$

The variable x_1 takes the value 0 but I think the solution is not degenerate. Specifically, the solution is $x_1 = 0, x_2 = 2.5, S_1 = 0, S_2 = 0$.
(linear-programming)

edited Jul 23 '16 at 19:44

 **mathreadler**
13k 7 17 54

asked Jul 23 '16 at 18:47

 **Panagiotis Radoglou**
16 1 5


If there are 2 distinct points in a space , for which the LPP is optimum, then all the points on the line joining the points and in between them , will serve as a optimum solution. – [Qwerty](#) Jul 23 '16 at 18:58

Hi and welcome to the site. Please consider learning LaTeX / mathjax typesetting. It will make questions and answers more readable by all participants. I assumed the S_1 and S_2 are slack variables. Is this the case? – [mathreadler](#) Jul 23 '16 at 19:45

1 Answer

An Linear Programming is degenerate if in a basic feasible solution, one of the basic variables takes on a zero value. Degeneracy is caused by redundant constraint(s), e.g. see [this example](#).

answered Jul 23 '16 at 18:52

 **Dietrich Burde**
71.5k 5 38 81

I edited my question for more details – [Panagiotis Radoglou](#) Jul 23 '16 at 19:37