

## Refutation of Karush-Kuhn-Tucker constraints for linear programming

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We assume the method and apparatus of Meth8/VL4 with Tautology as the designated *proof* value, **F** as contradiction, **N** as truthity (non-contingency), and **C** as falsity (contingency). Results are a 16-valued truth table in row-major and horizontal, or repeating fragments of 128-tables for more variables. (See ersatz-systems.com.)

LET: p LICQ linear independence of gradients constraint qualification;  
 q MFCQ Mangasarian-Fromovitz constraint qualification;  
 r CRCQ Constant rank constraint qualification;  
 s (CPLD Constant positive linear dependence constraint qualification =>  
 QNCQ Quasi-normality constraint qualification);

~ Not; & And; Imply >, => Not Imply <; = Equivalent; @ Not Equivalent.

From: en.wikipedia.org/wiki/Karush-Kuhn-Tucker\_conditions  
 and  
 Eustáúio, R.G.; Karas, E.W.; Ribeiro, A.A. (undated post 2006).  
 Constraint qualifications for nonlinear programming.  
 docs.ufpr.br/~ademir.ribeiro/ensino/cm721/kkt.pdf  
 rodrigogarcia1@bol.com.br (karas@mat.ufpr.br, ademir@mat.ufpr.br)

... although MFCQ is not equivalent to CRCQ: (0.1)

[i]t can be shown that LICQ => MFCQ => CPLD => QNCQ  
 and LICQ => CRCQ => CPLD => QNCQ (1.1.1)

(q@r)&(((p>q)>s)&((p>r)>s)); **FFFF FFFF FFTT TTF** (1.1.2)

For Eq. 0.1 is taken to imply Eq. 1.1: (1.2.1)

(q@r)>(((p>q)>s)&((p>r)>s)); **TTF FFFT TTT TTTT** (1.2.2)

(and the converses are not true) (2.1.1)

(q@r)&(((p<q)<s)&((p<r)<s)); **FFFF FFFF FFFF FFFF** (2.1.2)

For Eq. 0.1 is taken to imply Eq.2.1: (2.2.1)

(q@r)>(((p<q)<s)&((p<r)<s)); **TTF FFFT TTF FFFT** (2.2.2)

**Remark:** It is not clear how Eqs. 1.1 and 2.1 "can be shown" from the Eustáúio paper.

As rendered, Eqs. 1.1.2, 1.2.2, and 2.2.2 are *not* tautologous. Eq. 2.1.2 is contradictory, as expected from a converse-type operation. This refutes constraint qualifications for linear programming.