

## INDEX

- Active constraint 46, 106  
 affine functional 86  
   hull 30  
   minorant 86  
   set 16, 30  
 allocation 46  
 alternative theorem 83  
 antisymmetric 27  
 artificial variable 55  
 auxiliary LP problem 55
- Ball 29  
 basic feasible solution 27  
   solution 19  
   variable 19  
 basis 10  
   matrix 18  
 Beale algorithm 125  
 binding constraint 46, 106
- Canonical convex problem 116  
   minimum LP form 41  
   orthonormal basis 11  
   orthonormal decomposition 1  
   unit vectors 1
- Chebyshev approximation 68  
   point 68  
   linear approximation 69  
 closed convex function 87  
   half-space 4  
   unit ball 29  
 closure 29  
   of a convex function 86  
 column 12  
   rank 13  
   space 13  
   vector 11  
 compact 78  
 complementary slackness 46, 73, 106  
 cone 32  
 concave function 84  
 constraint qualification 119  
   region 39  
 convex combination 5  
   conjugate 90  
   function 84  
   hull 5  
   set 2  
 cost vector 39  
 cycling 53
- Decision space 106  
 deviation 68  
 diet problem 37  
 dimension of a subspace 11  
   of a subset 30  
 directional derivative 96  
 dual cone 32  
   problems 42, 107  
 duality gap 112  
   theorems 65, 111
- Effective domain 84  
 epigraph 84  
 equilibrium condition 46, 106  
 euclidean space 1  
 extreme point 7
- Face of a simplex 31  
 Farkas's lemma 83  
 feasible region 43  
   solutions 24, 27, 39  
 Fenchel's inequality 90  
 Fenchel transform 90  
 first orthant 4  
   phase 55  
 free variable 19
- Game theory 37, 104
- Half-space 4, 36, 76  
 hyperplane 4, 36  
   of support 78
- Indicator function 93  
 initial condition (simplex method) 47  
 inner product 1  
 integer LP problem 39  
 interior 29  
 involutory 45
- Jacobian matrix 102
- Kuhn-Tucker theorem 119
- Lagrange multiplier 102, 113  
 Lagrangian 102, 104, 114  
   theorem 119  
 Leontief matrix 38  
 Lexicographic ordering 28  
 linear form 9  
   functional 9  
   programming 24, 36, 122

## Index

148

- linearly dependent 9  
     independent 9  
 LP problem 36, 42, 55  
 lower semicontinuous 87
- Marginal function 108  
 matrix 11, 14  
     basis- 18  
 maximum LP form 42  
 minimum LP forms 39, 41  
     problem of nonlinear  
     programming 103  
 minorant 86  
 monotone property 96
- Non-basic variable 47  
 normal problem 113  
 null space 14
- Objective function 39  
 open half-space 4  
 optimal solution 39, 106  
     value 39, 106  
 ordering 27, 28  
 orthant 4  
 orthogonal 1  
 orthonormal 1
- Partial ordering 27  
 perturbed problem 106  
 perturbation function 108  
     space 107  
 phases I, II 55, 56  
 pivot 20  
 pivotal condensation 20  
 pointed cone 32  
 polyhedron 6, 31, 36  
 polytope 6  
 positive definite 100  
     semidefinite 100  
 primal problems 42, 107  
 production planning 38  
 proper convex function 85, 108
- Quadratic form 100, 125  
     programming 123  
 Quasiconvex function 95
- Rank 13  
     of a quadratic form 125  
 reflexive 27  
 region 39, 43  
 relative interior 30  
 revised simplex method 57  
 row vector 11
- Saddlepoint 104, 115, 117  
 second phase 56  
 separating hyperplane 76  
 separation 82  
 semicontinuous 87  
 shadow price 46  
 simplex 7, 31  
     method 47, 57  
 slack variable 40  
 Slater's condition 112, 119  
 solution 39, 106  
 stable problem 109  
 standard minimum LP form 39  
 strict separation 80  
 strong consistency 112  
     duality theorem 111  
 subdifferential 96  
 subgradient 96  
 sub-level set 95  
 subspace spanned 6  
 support 78, 81  
     function 93  
 surplus variable 40
- Tableau 52  
 test vector 47, 127  
 total ordering 27  
 transitive 27
- Unit ball 29  
     vector 1  
 usual ordering 27
- Valuation 46  
 value 106  
 variable 19, 40, 47, 55  
 vector 1, 11, 39  
     ordering 27  
 vertex 7, 24
- Weak duality 43, 107
- Young's inequality 90
- $A_{ij}$  11  
 $A^T$  12  
 $A_{i^*}$  12  
 $A_{*j}$  12  
 aff S 30  
 $A(f)$  86, 89  
 $B$  29  
 $\bar{f}$  86

Cambridge University Press

978-0-521-31207-3 - Introduction to Linear and Convex Programming

Neil Cameron

Index

[More information](#)

## Index

149

$\bar{S}$  29  
 $\langle S \rangle$  5  
 $\dim S$  30  
 $\text{dom } f$  84  
 $(D(F))$  107  
 $f'(x_0; x)$  96  
 $e_i$  1  
 $\text{epi } f$  84  
 $f^*$  89  
 $\langle x, y \rangle$  1  
 $\text{int } S$  29  
 $M(m, n)$  11  
 $M_g$  102  
 $\|x\|$  1  
 $(P(F))$  107  
 $(P(F, y))$   
 $p_F$  108  
 $r(A)$  13  
 $\text{ri}(S)$  30  
 $S(A, b)$  16  
 $S^+(A, b)$  24  
 $[S]$  6  
 $s$  127  
 $t(B)$  47  
 $\delta_C$  93  
 $\partial f(x_0)$  96  
 $\nabla f(x_0)$  96  
 $\geq$  4, 27  
 $\forall$  28