
Author Index

- Aleksandrov, A. D., 59, 238
 Anikonov, Yu. E., 239
 Apostol, T. M., 137
 Arnold, R., 41, 188
 Axler, S., 16, 66
- Bachmann, F., 139
 Backus, G., 117, 258
 Bandle, C., 138
 Bayer, M. M., 18
 Beltrami, E., 67
 Berg, C., 8, 67, 189
 Berwald, L., 239
 Blaschke, W., 19, 52, 116–117, 137, 141, 147,
 153, 194, 218, 238, 258, 309
 Bol, G., 147, 153, 218, 219
 Bolt'yanskii, V. G., 172
 Bonnesen, T., 17, 26, 40–41, 51–52, 153, 180,
 217, 219
 Boruvka, O., 139
 Bourdon, P., 16, 66
 Bourgain, J., 55, 238, 240
 Burago, Yu. D., 55
 Burger, T., 55, 238, 309
- Calderón, A. P., 132
 Campi, S., 55, 117, 238, 258
 Cayley, M. A., 67
 Chakerian, G. D., 26, 309–310
 Chernoff, P. R., 309
 Cieślak, S., 138, 172
 Clebsch A., 67
 Coifman R. R., 16, 75, 97
 Courant, R., 132, 138
- de Vries, H. L., 139
 Dinghas, A., 141, 147–148, 194–195, 218
 Diskant, V. I., 55
 Dupin, Ch., 258
- Eggleston, H. G., 17
 Erdélyi, A., 66, 97, 132
- Falconer, K. J., 16, 116–117, 238, 257,
 258
 Fallert H., 8, 59, 67, 117
 Federer, H., 45
 Fejes Tóth, L., 180
 Fenchel W., 17, 26, 40–41, 51–52, 153, 180,
 217, 219
 Fillmore, J. R., 295
 Firey, Wm. J., 19, 41, 310
 Fisher, J. C., 138–139
 Florian, A., 55, 180
 Focke, J., 173
 Fuglede, B., 41, 52, 148, 153, 213
 Fujiwara, M., 172–173
 Funk, P., 16, 116, 238, 258
- Gamelin, T. W., 138
 Gardner, R. J., 27, 52, 59, 118, 240, 258
 Gensel, B., 173
 Geppert, H., 147–148, 194
 Gericke, H., 138, 141, 147–148, 188
 Gilbert, E. N., 258
 Goodey, P. R., 8, 27, 59, 67, 96–97, 116–117,
 132, 188–189, 195, 238–240, 259
 Görtler, H., 141, 180
 Gózdź, S., 138, 172
 Grinberg, E. L., 41, 117, 188–189
 Groemer, H., 26, 41, 55, 116–117, 133, 147, 173,
 181, 188, 195, 213, 218, 238, 258, 309–310
 Gruber, P. M., 40–41, 67
 Grünbaum, B., 18, 258
- Hadwiger, H., 17, 45, 50, 302
 Hall, R. R., 139, 147
 Halmos, P. R., 43, 71, 187, 236
 Hardy, G. H., 132
 Hayashi, T., 141, 180
 Hayman, W. K., 147

- Hecke, E., 116
 Heil, E., 26, 41, 52, 309
 Heine, E., 67, 96
 Heinz, E., 139
 Helgason, S., 8, 16, 117
 Hilbert D., 132, 138
 Hobson, E. W., 67
 Hochstadt, H., 66, 97
 Howard, R., 97, 117, 239
 Hurwitz, A., 51, 133, 137–138, 141–142,
 147–148, 188, 194, 309

 Inzinger, R., 141

 Kakeya, S., 173
 Kamenezki, M., 172
 Khavinson, D., 138
 Klain, D. A., 27, 52, 189
 Klee, V. L., 258
 Klötzler, R., 173
 Knothe, H., 310
 Körner, T. W., 138
 Koutroufiotis, D., 19
 Kubota, T., 67, 75, 118, 141, 147, 173, 180,
 188, 194, 239, 258

 Lebesgue, H., 137
 Lekkerkerker C. G., 67
 Lee, C. W., 18
 Leichtweiß, K., 17
 Lense, J., 67
 Letac, G., 51
 Lindenstrauss, J., 55, 238, 240
 Lutwak, E., 27, 52, 55, 59, 310

 Macrobert, T. M., 67
 Magnus, W., 66, 97, 132
 McMullen, P., 59, 180, 195, 310
 Meissner, E., 97, 141, 172, 180, 295
 Milman, V. D., 240
 Minkowski, H., 17, 27, 51, 58, 116, 219,
 238
 Mitrinović, D. S., 55
 Monge, G., 309
 Müller, C., 16, 66, 75, 118, 125

 Nachbin, L., 16
 Nakajima, S., 118, 173, 238, 239
 Natanson, I. P., 66, 137
 Neumann, B. H., 139

 Oberhettinger, F., 66, 97, 132
 Ôishi, K., 238
 Osseman, R., 147, 153

 Pečarić, J. E., 55
 Petty, C. M., 116–117, 258

 Pólya, G., 138
 Prachar, K., 180
 Przesławski, K., 97
 Radon, J., 116
 Radziszewski, K., 309
 Ramey, W., 16, 66
 Reeder, M., 97, 117, 239
 Reshetnjak, Ju. G., 189
 Robert, A., 138
 Rockafellar, R. T., 41
 Royden, H. L., 5, 16
 Rudin, W., 5, 9, 70, 99
 Ruoff D., 138–139

 Sachs, H., 138–139
 Saint-Pierre, J., 41, 59, 310
 Sangwine-Yager, J. R., 51
 Santaló L. A., 148
 Sas, E., 180
 Schaal, H., 172
 Schmidt, E., 139
 Schmuckenschlaeger, M., 41
 Schneider, R., 16–17, 26–27, 40–41, 51, 55, 59,
 66, 75, 97, 116–118, 125, 132, 180,
 188–189, 195, 213, 218, 238–239, 240,
 257–258, 295, 309–310
 Schoenberg, I. J., 139
 Seeley, R. T., 8, 75, 132
 Seidel, J. J., 67, 125
 Shephard, G. C., 26, 180
 Shilto J., 138–139
 Sloane, N. J. A., 125
 Priestersbach, K. K., 239
 Stein, E. M., 66–67, 75, 97
 Steiner, J., 180
 Stepanov, V. N., 239
 Strichartz, R. S., 117
 Su, B., 141, 180
 Sz.-Nagy, B., 66, 137
 Szegő, G., 138

 Talenti, G., 55
 Taylor, A. E., 70
 Tennison, R. L., 138, 172
 Titchmarsh, E. C., 66
 Todhunter, I., 67, 96
 Tolstov, G. P., 66
 Tricomi, F., 66, 97, 132

 Ungar, P., 118, 239

 Valentine, F. A., 17
 Vilenkin, N. J., 97
 Vitale, R., 41
 Volčič, A., 52, 258
 Volenec, V., 55

 Wallen, L. J., 153, 219
 Wangerin, A., 67, 96

Cambridge University Press

978-0-521-47318-7 - Geometric Applications of Fourier Series and Spherical Harmonics

H. Groemer

Index

[More information](#)

Author Index

325

- Watson, G. N., 96
Wawrzyńczyk, A., 97
Webster, R. J., 17
Wegmann, R., 139
Weil, W., 8, 27, 59, 67, 116–117, 132, 189, 238,
240, 259
Weiss, G., 16, 66–67, 75, 97
Weitsman, A. W., 147
Wellerding, A., 41
Weyl, H., 67
Whittaker, E. T., 96
Yaglom, I. M., 172
Zalcman, L., 118
Zalgaller, V. A., 55
Zhang, G., 41, 117, 132, 188–189, 240
Zygmund, A., 66, 132

Subject Index

- Abel summability, 116, 132
 addition theorem for Legendre polynomials, 81
 approximation
 of convex bodies, 38, 188
 of convex bodies by generalized zonoids, 187
 of convex domains by inscribed polygons, 177
 of functions by orthogonal sequences, 4
 of functions by spherical harmonics, 70
 of support functions by spherical harmonics, 185
 area, 41
 its relation to Fourier series, 139
 signed, 135
 area measure, 43, 189, 218, 233
 associated angles, 160
 associated Legendre functions, 120, 272
 special, 123
 asymmetry, 247–248
 average chord length, 51, 244–246
- Barbier's theorem, 46, 219
 Beltrami operator, 6, 8, 113
 applied to harmonic expansions, 74
 applied to spherical harmonics, 74
 applied to support functions, 46
 Bessel's inequality, 3
 Blaschke's selection theorem, 35, 265
 Bonnesen's inequality, 143–144, 153
 Bonnesen-type inequality, 151, 196
 boundary curve, 18
 brightness. *see* convex body of constant brightness
- Cauchy's surface area formula, 46, 239, 279
 its instability, 298
 its stability, 300
 center of curvature, 22
 centered, 18, 241
 central symmetrization, 55
 centroid, 57, 172
 centroid ball, 57, 198
 centroid body, 250
 Chebyshev polynomial, 78
 chord, 50
 chordal distribution, 244
 chordal symmetrization, 244
 Christoffel's problem, 189
 circumradius, 17
 circumscribed boxes, 296, 310
 circumscribed cylinders, 301
 completeness
 of orthogonal sequences, 4
 of sequences of spherical harmonics, 71
 of sequences of trigonometric functions, 61
 condensed harmonic expansion, *see* harmonic expansion
 convergence,
 in mean, 2
 of sequences of convex bodies, 35
 uniform, 127
 convex body, 17
 centered, 18, 35
 centrally symmetric, 18, 233–234
 of constant average brightness, 234
 of constant brightness, 234, 239
 of constant girth, 219
 of constant width, 20, 219, 225, 260
 d -dimensional, 17
 dual, 26
 floating, 256
 normal, 199
 polar dual, 26
 convex domain, 17
 of constant width, 20
 n -fold rotationally symmetric, 169, 172–173
 convex polygon, 18
 equiangular, 154
 inscribed, 177
 tangential, 154
 cosine transformation, 98, 249
 of harmonic expansions, 105
 its injectivity, 106

Subject Index

327

- its stability, 110
- its surjectivity, 128
- of spherical harmonics, 102
- curve, 133
 - rectifiable, 133
- cylindrical mean value, 301–302

- derived polygonal domain, 167
- derived polytopal set, 266
- diameter, 17
- difference body, 55
- differentiable functions on S^{d-1} , 5
- dilated centroid body, 250
- dimension of \mathcal{H}_n^d , 65
- distance function, 26

- eccentricity function, 247–248
- ellipsoid, 21, 295
- elliptic paraboloid, 309
- endomorphism of \mathcal{K}^d , 310
- equatorial component, 16
- equiangular polygon, 154
 - tangential, 154, 157, 172
- equichordal body, 245
- equiproportional body, 245
- equivariant endomorphism, 310
- equiwide, 221
- ϵ -smooth, 19, 23
- error correcting codes, 125
- essential half-plane, 159
- estimates
 - for Legendre polynomials, 82
 - for spherical harmonics, 126, 129
- evolute, 146

- facet, 18
 - of a polytopal set, 259
- Fourier coefficients, 2
- Fourier series
 - classical, 60
 - general, 3
 - multiple, 67
 - of support functions, 139
 - trigonometric, 60
- freak theorems, 118, 239
- function spaces
 - of polynomials, 63
 - of spherical harmonics, 63
- Funk–Hecke theorem, 98, 101, 116

- Gegenbauer polynomials, 97
- generalized zonoid, 26
- generating function
 - for Gegenbauer polynomials, 97
 - for Legendre polynomials, 80
- girth, 219
- gradient, 5,
 - of radial functions, 48
 - of support functions, 20, 40, 46
- great circle, 10

- Green’s formula, 6
- group
 - of isometries, 12
 - of orthogonal transformations, 12
 - representation, 82
 - of rotations, 12
 - topological, 13

- Haar measure, 13
- half-bodies, 248
- harmonic, *see* spherical harmonics
- harmonic expansion, 71
 - condensed, 72
 - of functions on S^2 , 132
 - of support functions, 181
 - of transformed function, 105
 - uniform convergence of, 127
- harmonic polynomial, 62
- Hausdorff distance, 27
- Hausdorff metric, 27–28, 41
- Heinz constant, 139
- hemispherical transformation, 98
 - of harmonic expansions, 105
 - its injectivity, 107
 - its stability, 110
 - of spherical harmonics, 102
- Hilbert space, 2

- illuminated portion, 233, 239
- inequality
 - Aleksandrov–Fenchel, 52
 - Bieberbach, 53
 - Brunn–Minkowski, 52
 - generalized Brunn–Minkowski, 53
 - isoperimetric, *see* isoperimetric inequality
 - for mean projection measures, 190–191
 - Minkowski, 53
 - for mixed areas, 144
 - for mixed volumes, 189, 215
 - Urysohn, 53
- injectivity
 - of the cosine transformation, 106
 - of the hemispherical transformation, 107
 - for projection bodies of order one, 223
 - for projection bodies of order $d - 1$, 226
 - of the Radon transformation, 108
- inner product
 - of functions, 2
 - of Legendre polynomials, 83
 - of vectors, 1
 - weighted, 83
- inradius, 17, 160
- integral transformations, 97
 - their harmonic expansions, 100
- intersections
 - of a convex body with half-spaces, 240, 246
 - of a convex body with hyperplanes, 240–241
- intrinsic volume, 51
- invariant measure, 13, 123
- invariant sets of spherical harmonics, 76, 81

- irreducible group representation, 81–82
- isometry, 12
- isoperimetric deficit, 195, 197
- isoperimetric inequality, 53
 - for convex domains, 142
 - for convex bodies, 195
 - its stability, 142, 195, 198
 - for plane regions, 133, 135
- Jordan content, 134
- Jordan curve, 18, 134
- Jordan measurability, 41
- Kubota's formulas, 45
- Laplace operator, 5
- Laplace–Beltrami operator, *see* Beltrami operator
- Lebesgue measure,
 - on the sphere, 1
 - on $S(p)$, 10
 - on $S(p, r)$, 10
- Legendre polynomial, 80
 - classical, 81
 - its addition theorem, 80
 - its derivatives, 87
 - its differential equation, 90
 - its generating function, 92
 - its integral representation, 119
 - its leading coefficient, 85
 - its recurrence relation, 89
 - special, 85, 97
- linearly associated unit vectors, 269
- Lipschitz constant, 227
- Lipschitz continuity
 - of mean projection measures, 44
 - of support functions, 20
- L_2 -metric, 28, 41
 - its relation to Fourier series, 140
 - its relation to harmonic expansions, 182
- maximal subsphere, 10
- mean projection measure, 44
 - its relation to harmonic expansions, 184
- mean section body, 259
- mean width, 45, 300
 - its relation to harmonic expansions, 182
- measure of asymmetry, 247
- Minkowski addition, 17
- Minkowski sum, 18
- mixed area, 42
 - invariance under rotation, 175
 - its relation to Fourier series, 140
- mixed area inequality, 144
 - its stability, 144
- mixed volume, 42–43, 46
 - its relation to harmonic expansions, 185
- moment
 - axial, 138
 - central, 50, 248
 - of inertia 136
- norm
 - Euclidean, 1
 - of functions, 2
 - supremum, 5
 - of vectors, 1
- order
 - of Legendre polynomials, 80
 - of spherical harmonics, 65
- orthogonal complement, 19
- orthogonality
 - of functions, 2
 - of Legendre polynomials, 83
 - of spherical harmonics, 68
- orthogonal projection, 45, 55, 215, 219, 234–235
- orthogonal transformation, 12
 - of spherical harmonics, 69
- osculating ball, 259, 264
- osculating body, 259
- osculating circle, 167
- osculating domain, 154
- parallel body, 41
- parallelootope, 18
 - rhombic, 260, 266
- Parseval's equation, 3
 - generalized, 4, 61, 73
 - for harmonic expansions, 72–73
 - for trigonometric Fourier series, 61
- pedal curve, 180
- perimeter, 45–46
 - its relation to Fourier series, 139
- perturbation of support functions, 23
- Poisson integral, 98, 114, 227
 - harmonic expansion, 114
 - of spherical harmonics, 114
- Poisson process, 239
- polar representation, 16
- pole, 15
- polygon, 18
- polygonal approximation, 176
- polygonal domain, 158
- polytopal set, 259, 266
- polytope, 18
- principal radii of curvature, 38, 43, 51, 195, 235
- projection body, 55, 221
 - of order $d - 1$, 226
 - of order one, 221–223
- radial extension, 5
- radial function, 26, 35, 240
- radial power integrals, 50, 241, 255
- radius of curvature, 22
 - its relation to Fourier series, 141
- Radon transformation, 12, 98, 241
 - of harmonic expansions, 106
 - its injectivity, 108
 - its stability, 110
 - its surjectivity, 128
 - of spherical harmonics, 103
- regular direction, 20

Subject Index

329

- regular support plane, 19
- representation of groups, 82
- Rodrigues's formula, 84
- rotation, 12
- rotational symmetry, 169
- rotor, 158, 259, 266
 - in an octahedron, 261, 266
 - in a polygonal domain, 167
 - in a polytopal set, 259, 266
 - in a regular simplex, 266, 302
 - in a rhombic parallelotope, 260, 266
 - in a sporadic cone, 266, 302
 - in a tetrahedron, 261, 266
 - in a triangular domain, 159, 160
- Schur's Lemma 116
- self-adjoint operator, 7, 12, 99
- semi-girth, 238
- sequence,
 - Cauchy, 2
 - complete orthogonal, 4
 - orthogonal, 2
 - orthonormal, 2
 - standard, 68
 - of support functions, 40
- slab, 260
- spherical harmonics, 63
 - estimates of their size, 126
 - estimates of the size of their derivatives, 129
 - even, 66, 72
 - odd, 66, 72
 - of order one, 68
 - solid 67
 - surface, 67
 - their representation by associated Legendre functions, 121
 - their representation by Legendre polynomials, 94
 - their completeness, 71
 - three-dimensional, 131
- sphere packings, 125
- sporadic cone, 266, 276
- square integrable function, 1
- stability
 - of inequalities, 54
 - for integral transformations, 109
 - for projection bodies of order $d - 1$, 226
 - for projection bodies of order one, 222
 - for radial power integrals, 242
- standard sequence, 68
- star body, 35, 240
 - centered, 247
- Steiner point, 55, 144, 193, 234
 - characterizations, 173, 306
 - minimal properties, 136, 183, 188
 - its relation to Fourier series, 139
 - its relation to harmonic expansions, 182
- Steiner ball, 56, 190
- Steiner disk, 56, 142
- strictly convex body, 17
- strip, 159
- support function, 19
 - of convex bodies of constant width, 260
 - of convex domains, 21–22
 - extended, 19
 - its absolute continuity, 21
 - its gradient, 20
 - perturbation of, 23
 - restricted, 19
 - of rotors, 261, 266
 - that is a sum of spherical harmonics, 185
 - translation formula for the, 20
- support line, 19
- support plane, 19
 - regular, 19
- support point, 19–20
- support set, 19
- supporting half-space, 19
- surface area, 44–46, 48
- surjectivity
 - of cosine transformation, 128
 - of Radon transformation, 128
- symmetric difference metric, 41, 147, 213
- tangential polygon, 154
 - equiangular, 154, 157, 172
 - regular, 157
- tangential polytopal set, 259
- tangential wedge, 169
- triangular domain, 159
 - singular, 159–160
- unit ball, 1
- volume, 1, 41
- wedge, 158
 - tangential, 169
- width, 20
- width function, 20
- Wirtingers inequality,
 - for functions on S^2 , 213
 - for functions on S^{d-1} , 149
- zonal function, 118
- zonal harmonic, 118
- zonoid, 26, 240
- zonotope, 26