ISOMETRIES

ON BANACH SPACES:

function spaces

RICHARD J. FLEMING JAMES E. JAMISON



A CRC Press Company Boca Raton London New York Washington, D.C.

Library of Congress Cataloging-in-Publication Data

Fleming, Richard J.
Isometries on Banach spaces : function spaces / by Richard J. Fleming and James E. Jamison.
p. cm. — (Chapman & Hall/CRC monographs and surveys in pure and applied mathematics ; 129)
Includes bibliographical references and index.
ISBN 1-58488-040-6 (alk. paper)
1. Function spaces. 2. Banach spaces. 3. Isometrics (Mathematics) I. Jamison, James E.
II. Title. III. Series.

QA323 .F55 2002
515'.73—dc21
2002041118

CIP

This book contains information obtained from authentic and highly regarded sources. Reprinted material is quoted with permission, and sources are indicated. A wide variety of references are listed. Reasonable efforts have been made to publish reliable data and information, but the authors and the publisher cannot assume responsibility for the validity of all materials or for the consequences of their use.

Neither this book nor any part may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, microfilming, and recording, or by any information storage or retrieval system, without prior permission in writing from the publisher.

The consent of CRC Press LLC does not extend to copying for general distribution, for promotion, for creating new works, or for resale. Specific permission must be obtained in writing from CRC Press LLC for such copying.

Direct all inquiries to CRC Press LLC, 2000 N.W. Corporate Blvd., Boca Raton, Florida 33431.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation, without intent to infringe.

Visit the CRC Press Web site at www.crcpress.com

© 2003 by Chapman & Hall/CRC

No claim to original U.S. Government works International Standard Book Number 1-58488-040-6 Library of Congress Card Number 2002041118 Printed in the United States of America 1 2 3 4 5 6 7 8 9 0 Printed on acid-free paper

Contents

Preface	vii
Chapter 1. Beginnings	1
1.1. Introduction	1
1.2. Banach's Characterization of Isometries on $C(Q)$	2
1.3. The Mazur-Ulam Theorem	6
1.4. Orthogonality	10
1.5. The Wold Decomposition	15
1.6. Notes and Remarks	19
Chapter 2. Continuous Function Spaces-The Banach-Stone Theorem	25
2.1. Introduction	25
2.2. Eilenberg's Theorem	26
2.3. The Nonsurjective Case	29
2.4. A Theorem of Vesentini	39
2.5. Notes and Remarks	42
Chapter 3. The L^p Spaces	49
3.1. Introduction	49
3.2. Lamperti's Results	50
3.3. Subspaces of L^p and the Extension Theorem	55
3.4. Bochner Kernels	67
3.5. Notes and Remarks	72
Chapter 4. Isometries of Spaces of Analytic Functions	79
4.1. Introduction	79
4.2. Isometries of the Hardy Spaces of the Disk	79
4.3. Bergman Spaces	89
4.4. Bloch Spaces	92
4.5. S^p Spaces	96
4.6. Notes and Remarks	98
Chapter 5. Rearrangement Invariant Spaces	
5.1. Introduction	103
5.2. Lumer's Method for Orlicz Spaces	104
5.3. Zaidenberg's Generalization	118
5.4. Musielak-Orlicz Spaces	127

v

5.5.	Notes and Remarks	142
Chapte	r 6. Banach Algebras	145
6.1.	Introduction	145
6.2.	Kadison's Theorem	146
6.3.	Subdifferentiability and Kadison's Theorem	151
6.4.	The Nonsurjective Case of Kadison's Theorem	157
6.5.	The Algebras $C^{(1)}$ and AC	164
6.6.	Douglas Algebras	168
6.7.	Notes and Remarks	171
Bibliography		181