${\bf Contents}$

Ι	Symmetries	3
1		5
	1.1 Matrix Groups	6
	1.1.1 Subgroups of $GL(n, \mathbb{F})$	7
2	Manifolds	9
3	Lie Group Theory	10
	3.1 Lie Groups	10
	3.1.1 Group Multiplication	10
	3.1.2 Group Inversion	10
	3.2 Lie Group Manifolds	11
	3.2.1 Special Orthogonal Group	11
4	Lie Algebras	13
	4.1 Definition	13
	4.2 Connecting Lie Algebras and Lie Groups	15
	4.2.1 Matrix Lie Algebras	16
	4.2.2 Translations	20
	4.3 Lie Groups from Lie Algebras	22
	4.3.1 $SO(3)$ is $SU(2)$	24
II	Representation Theory	26
5	Representations of Lie Algebras	27