

Contents

Getting the most from this book

iv

1 Matrices and transformations 1

1.1	Matrices	2
1.2	Multiplication of matrices	6
1.3	Transformations	13
1.4	Successive transformations	23
1.5	Invariance	28

2 Introduction to complex numbers 35

2.1	Extending the number system	36
2.2	Division of complex numbers	40
2.3	Representing complex numbers geometrically	43

3 Roots of polynomials 48

3.1	Polynomials	49
3.2	Cubic equations	54
3.3	Quartic equations	58
3.4	Solving polynomial equations with complex roots	61

4 Sequences, series and proof by induction 66

4.1	Sequences and series	67
4.2	Using standard results	72
4.3	Mathematical induction	75
4.4	Other proofs by induction	79
	Practice questions 1	84

5 Applications of integration 86

5.1	Volumes of revolution	86
-----	-----------------------	----

6 Complex numbers and geometry 96

6.1	The modulus and argument of a complex number	97
6.2	Multiplying and dividing complex numbers in modulus-argument form	105
6.3	Loci in the Argand diagram	109

7 Matrices and their inverses 122

7.1	The determinant of a matrix	123
7.2	The inverse of a matrix	129
7.3	The determinant and inverse of a 3×3 matrix	135
7.4	Using matrices to solve simultaneous equations	141

8 Vectors and 3D space 147

8.1	Finding the angle between two vectors	147
8.2	The vector equation of a line	154
8.3	The equation of a plane	166
8.4	Intersection of planes	172
8.5	Lines and planes	180
8.6	Finding distances	184
	Practice questions 2	195

An introduction to radians 198

The identities $\sin(\theta \pm \phi)$ and $\cos(\theta \pm \phi)$ 201

Answers 203

Index 248