

# Detailed Table of Contents

Preface	viii	<b>5 Finance and growth</b>	117
Guided tour	ix	5.1 Introduction	118
Technology to enhance learning and teaching	x	5.2 Arithmetic progressions	119
Acknowledgements	xiii	5.3 Geometric progressions	123
<b>1 Mathematical review</b>	1	5.4 Practical applications: simple and compound interest	129
1.1 Introduction	2	5.5 Practical applications: investment appraisal	132
1.2 The arithmetic operators	2	5.6 A further practical application: economic growth	140
1.3 Fractions	4	<i>Answers to quick problems</i>	144
1.4 Percentages	7	<b>6 Non-linear equations and principles of differentiation</b>	153
1.5 Powers	12	6.1 Introduction	154
1.6 Logarithms	16	6.2 Functions with more than one independent variable	154
1.7 Basic rules of algebra	17	6.3 Factorization	160
<i>Answers to quick problems</i>	22	6.4 The quadratic formula	163
<b>2 Linear equations</b>	27	6.5 Economics application of quadratic equations	168
2.1 Introduction	28	6.6 Basic principles of differentiation	173
2.2 Co-ordinates	28	6.7 The simple derivative	173
2.3 Linear form	29	6.8 The sum rule and the difference rule	180
2.4 Equation of a line	34	6.9 The product rule	182
2.5 Intersection	38	6.10 The quotient rule	185
2.6 Application of linear equations in economics	44	6.11 The chain rule	186
<i>Answers to quick problems</i>	56	<i>Answers to quick problems</i>	188
<b>3 Linear equations: further topics</b>	59	<b>7 Marginal concepts and optimization</b>	191
3.1 Introduction	60	7.1 Introduction	192
3.2 Simultaneous linear equations with more than two unknowns	60	7.2 Marginal functions	192
3.3 Market equilibrium and changes in supply or demand	66	7.3 Demand, total revenue and marginal revenue	193
3.4 Cost, volume and profit analysis	71	7.4 Total and marginal cost	197
3.5 Effects of a per unit tax	73	7.5 Production	198
3.6 Macroeconomic models	76	7.6 Consumption and savings	202
<i>Answers to quick problems</i>	86	7.7 Second-order derivatives	203
<b>4 Linear programming</b>	89	7.8 Optimization	205
4.1 Introduction	90	7.9 The use of optimization in economics	210
4.2 Graphing inequalities	90	<i>Answers to quick problems</i>	213
4.3 Graphing simultaneous linear inequalities	95	<b>8 Partial differentiation</b>	215
4.4 The objective function	98	8.1 Introduction	216
4.5 Unbounded feasible regions	104	8.2 Functions of two variables	216
4.6 Application of linear programming in economics	105	8.3 Partial derivatives	217
<i>Answers to quick problems</i>	113		

8.4	Second-order partial derivatives	219	9.10	Definite integrals using exponentials	267
8.5	Changes to independent and dependent variables	221		<i>Answers to quick problems</i>	269
8.6	Partial elasticity	223	<b>10</b>	<b>Matrices</b>	275
8.7	Partial differentiation and marginal functions	225	10.1	Introduction	276
8.8	Unconstrained optimization	231	10.2	Definitions, notation and operations	276
8.9	Constrained optimization	237	10.3	Vectors	279
8.10	Lagrange multipliers	240	10.4	Adding and subtracting matrices	280
	<i>Answers to quick problems</i>	244	10.5	Dealing with 'zero matrices'	282
<b>9</b>	<b>Integration</b>	247	10.6	Scalar multiplication of matrices	282
9.1	Introduction	248	10.7	Multiplying matrices	284
9.2	Indefinite integration	249	10.8	Matrix inversion	287
9.3	Integrating $\frac{1}{x}$	252	10.9	Application of $2 \times 2$ matrices and inversions: solving economic equations	290
9.4	Integrating using exponentials ( $e^x$ )	253	10.10	Inversions of $3 \times 3$ matrices	292
9.5	Integrating expressions with multiple terms	254	10.11	Application of $3 \times 3$ matrices and inversions: solving economic equations	293
9.6	Application of indefinite integration	255	10.12	Cramer's rule	300
9.7	Definite integrals	260		<i>Answers to quick problems</i>	304
9.8	Applying definite integrals: consumer surplus	265	<b>Index</b>		309
9.9	Applying definite integrals: producer surplus	267			