CP1 Chapter 6

Matrices

Chapter Overview

1. Understand matrices and perform basic operations (adding, scalar multiplication)

2. Multiply Matrices

3. Find the determinant or inverse of a matrix

4. Solve simultaneous equations using matrices

3 **Matrices**	3.1	**Add, subtract and multiply conformable matrices.** **Multiply a matrix by a scalar.**	
	3.2	**Understand and use zero and identity matrices.**	

3 **Matrices** *continued*	3.3	**Use matrices to represent linear transformations in 2-D.** **Successive transformations.** **Single transformations in 3-D.**	**For 2-D, identification and use of the matrix representation of single and combined transformations from: reflection in coordinate axes and lines $y = \pm x$, rotation through any angle about $(0, 0)$, stretches parallel to the x-axis and y-axis, and enlargement about centre $(0, 0)$, with scale factor k, $(k \neq 0)$, where $k \in \mathbb{R}$.** **Knowledge that the transformation represented by $\mathbf{AB}$ is the transformation represented by $\mathbf{B}$ followed by the transformation represented by $\mathbf{A}$.** **3-D transformations confined to reflection in one of $x = 0, y = 0, z = 0$ or rotation about one of the coordinate axes.** **Knowledge of 3-D vectors is assumed.**
	3.4	**Find invariant points and lines for a linear transformation.**	**For a given transformation, students should be able to find the coordinates of invariant points and the equations of invariant lines.**
	3.5	**Calculate determinants of** **2 x 2 and 3 x 3 matrices and interpret as scale factors, including the effect on orientation.**	**Idea of the determinant as an area scale factor in transformations.**
	3.6	**Understand and use singular and non-singular matrices.** **Properties of inverse matrices.** **Calculate and use the inverse of non-singular 2 x 2 matrices and 3 x 3 matrices.**	**Understanding the process of finding the inverse of a matrix is required.** **Students should be able to use a calculator to calculate the inverse of a matrix.**

3 **Matrices** *continued*	3.7	**Solve three linear simultaneous equations in three variables by use of the inverse matrix.**	
	3.8	**Interpret geometrically the solution and failure of solution of three simultaneous linear equations.**	**Students should be aware of the different possible geometrical configurations of three planes, including cases where the planes,** **(i) meet in a point** **(ii) form a sheaf** **(iii) form a prism or are otherwise inconsistent**

Introduction

A matrix (plural: matrices) is **simply an 'array' of numbers**, e.g.

$$\begin{pmatrix} 1 & 0 & -2 \\ 3 & 3 & 0 \end{pmatrix}$$

On a simple level, a matrix is just a way to organise values into rows and columns, and represent these multiple values as a single structure.

The dimension of a matrix is its **size**, in terms of its number of **rows** and **columns** (in that order).

Examples:

Matrix	Dimension
$\begin{pmatrix} 1 & 3 & -7 \\ 4 & 0 & 5 \end{pmatrix}$	
$\begin{pmatrix} 1 \\ 6 \\ -3 \end{pmatrix}$	
$\begin{pmatrix} 1 & 6 & 0 \end{pmatrix}$	

Matrix Fundamentals

Operations with Matrices

1. Addition and subtraction

2. Scalar Multiplication

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