

# Vectors and matrices revision sheet

IB SL

1. Given that  $\mathbf{a} = 3\mathbf{i} - 2\mathbf{j} + \mathbf{k}$  and  $\mathbf{b} = 2\mathbf{i} + 3\mathbf{j} - 5\mathbf{k}$  and  $\mathbf{c} = \mathbf{i} - 2\mathbf{j} - 2\mathbf{k}$ , find the angle between,

a)  $\mathbf{a}$  and  $\mathbf{c}$

b)  $\mathbf{b}$  and  $\mathbf{c}$

2.  $X = \begin{bmatrix} 4 & 1 \\ 5 & 2 \end{bmatrix}$  and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , find the value of  $\lambda$  such that  $(X - \lambda I)$  is a singular matrix.

3.  $A = \begin{bmatrix} 3 & 1 & -5 \\ 2 & 4 & -1 \\ -1 & -3 & 9 \end{bmatrix}$ ,  $B = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ ,  $C = \begin{bmatrix} -13 \\ -5 \\ 31 \end{bmatrix}$ .

a) Show that the determinant of  $A$  is .

b) Given that  $AB = C$ , find the values of  $x, y$ , and  $z$ .

4.  $\mathbf{a} = 2\mathbf{i} - 3\mathbf{j}$ ,  $\mathbf{b} = 4\mathbf{i} + 6\mathbf{j}$ ,  $\mathbf{c} = -6\mathbf{i} - 9\mathbf{j}$ ,  $\mathbf{d} = 6\mathbf{i} + 4\mathbf{j}$

a) Find a pair of vectors that are perpendicular.

b) Find a pair of vectors that do not intersect.

c) Find the angle made between the vectors  $\mathbf{a}$  and  $\mathbf{c}$ .

5. An aeroplane is at a coordinate of (1000, 400, 700). It flies on a straight line to the coordinate (1200, 700, 1800).

Find the vector equation of the straight line the aeroplane is flying on.

6.  $A = \begin{bmatrix} a & 1 \\ 0 & b \end{bmatrix}$ ,  $B = \begin{bmatrix} 0 & c \\ d & 1 \end{bmatrix}$

In terms of  $a, b, c$ , and  $d$ , find:

a)  $3A$

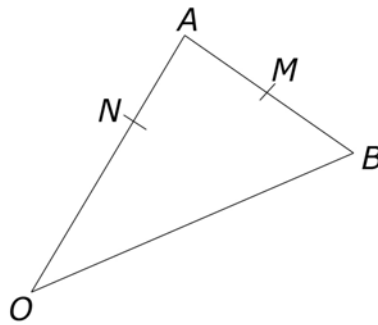
b)  $A + B$

c)  $AB$

d)  $A^2$

7. In the diagram below  $N = \frac{2}{3}OA$  and  $M = \frac{1}{2}AB$ .

$OA$  is represented by vector  $\mathbf{a}$ , and  $OB$  is represented by vector  $\mathbf{b}$ .



Find in terms of  $\mathbf{a}$  and  $\mathbf{b}$ ,

- a)  $AB$
  - b)  $AM$
  - c)  $OM$
  - d)  $NM$
- 8.
9. Find the unique set of solutions for the following set of simultaneous equations.
- $$3x + 5y + z = 0$$
- $$2x - y + 8z = 3$$
- $$x + 10y - z = 7$$

10.