

# MA2104

AY22/23 Sem 1

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## 01. Vectors, Lines, Planes

• **Dot Product** -  $a \cdot b = ||a|| ||b|| \cos \theta$

- $a \cdot b = b \cdot a$       $a \cdot (b + c) = a \cdot b + a \cdot c$
- $a \cdot b = 0 \Leftrightarrow a \perp b$

• **Projection** -  $\text{proj}_a b = \frac{a \cdot b}{a \cdot a} a$

- $\text{comp}_a b = ||\text{proj}_a b|| = \frac{a \cdot b}{||a||}$

• **Cross Product** -  $a \times b = \begin{vmatrix} i & j & k \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix} = \langle a_2 b_3 - a_3 b_2, -(a_1 b_3 - b_1 a_3), a_1 b_2 - a_2 b_1 \rangle$

- $a \times b \perp a$  and  $\perp b$       $a \times b = -b \times a$
- $||a \times b|| = ||a|| ||b|| \sin \theta$      Direction: Right hand rule

## 02. Functions of 2 Variables

## 03. Derivative

## 04. Gradient Vector