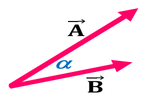
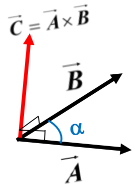
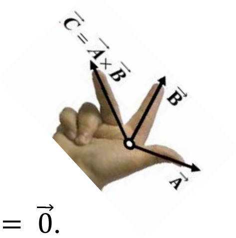
Keep in mind course 1	
Components of a Vector	One dimension, D1: $\vec{A} = A_x\vec{\imath}$ Two dimensions, D2: $\vec{A} = A_x\vec{\imath} + A_y\vec{\jmath}$ Three dimensions, D3: $\vec{A} = A_x\vec{\imath} + A_y\vec{\jmath} + A_z\vec{k}$
Magnitude of the vector $\lvert\vec{A}\rvert = \lVert\vec{A}\rVert = A$	One dimension, D1: $\lvert\vec{A}\rvert = \lvert A_x\rvert$ Two dimensions, D2: $\lvert\vec{A}\rvert = \sqrt{A_x^2 + A_y^2}$ Three dimensions, D3: $\lvert\vec{A}\rvert = \sqrt{A_x^2 + A_y^2 + A_z^2}$
Addition of vectors	$\vec{A} + \vec{B} = (A_x + B_x)\vec{\imath} + (A_y + B_y)\vec{\jmath} + (A_z + B_z)\vec{k}$
Subtraction of vectors	$\vec{A} - \vec{B} = (A_x - B_x)\vec{\imath} + (A_y - B_y)\vec{\jmath} + (A_z - B_z)\vec{k}$
Scalar product **or** **Dot product** $\vec{A}\cdot\vec{B}$ is a real number	$\vec{A}\cdot\vec{B} = \lVert\vec{A}\rVert\,\lVert\vec{B}\rVert\, cos\alpha$ $\vec{A}\cdot\vec{B} = A_xB_x + A_yB_y + A_zB_z$ Condition of perpendicularity of two vectors: $\vec{A}\cdot\vec{B} = 0 \Leftrightarrow \vec{A} \perp \vec{B}$ 
Vector product **Or** **Cross Product** $\vec{A}\times\vec{B}$ or $\vec{A}\wedge\vec{B}$ is a vector	Magnitude $\lVert\vec{C}\rVert = \lVert\vec{A}\times\vec{B}\rVert = \lVert\vec{A}\rVert\lVert\vec{B}\rVert\lvert\sin\alpha\rvert$ Direction $\underbrace{(\vec{A}\times\vec{B})}_{\vec{c}} \perp \vec{A}$ *and* $\underbrace{(\vec{A}\times\vec{B})}_{\vec{c}} \perp \vec{B}$  $\vec{A}\times\vec{B} = \begin{vmatrix} \vec{\imath} & \vec{\jmath} & \vec{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix}$ $= (A_yB_z - A_zB_y)\vec{\imath} + (A_zB_x - A_xB_z)\vec{\jmath}$ $+ (A_xB_y - A_yB_x)\vec{k}$  Condition of parallelism of two vectors $\vec{A} \mathbin{/\!/} \vec{B} \Leftrightarrow \vec{A}\times\vec{B} = \vec{0}$.
The differential operator nabla $\vec{\nabla} = \frac{\partial}{\partial x}\vec{\imath} + \frac{\partial}{\partial y}\vec{\jmath} + \frac{\partial}{\partial z}\vec{k}$	The gradient of a scalar field: $F(x,y,z)$ $\overrightarrow{grad}F = \vec{\nabla}F = \frac{\partial F(x,y,z)}{\partial x}\vec{\imath} + \frac{\partial F(x,y,z)}{\partial y}\vec{\jmath} + \frac{\partial F(x,y,z)}{\partial z}\vec{k}$ The divergence of a vector field: $\vec{G}(x,y,z) = G_x\vec{\imath} + G_x\vec{\jmath} + G_x\vec{k}$ $div\,\vec{G} = \vec{\nabla}\cdot\vec{G} = \frac{\partial G_x}{\partial x} + \frac{\partial G_y}{\partial y} + \frac{\partial G_z}{\partial z}$ Curl of a vector field: $\vec{G}(x,y,z) = G_x\vec{\imath} + G_x\vec{\jmath} + G_x\vec{k}$ $Curl\,\vec{G} = \vec{\nabla}\times\vec{G} = \begin{vmatrix} \vec{\imath} & \vec{\jmath} & \vec{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ G_x & G_y & G_z \end{vmatrix}$ $= \left(\frac{\partial G_z}{\partial y} - \frac{\partial G_y}{\partial z}\right)\vec{\imath} + \left(\frac{\partial G_x}{\partial z} - \frac{\partial G_z}{\partial x}\right)\vec{\jmath} + \left(\frac{\partial G_y}{\partial x} - \frac{\partial G_x}{\partial y}\right)\vec{k}$

Plus (+), minus (-), multiply (×),Equal (=),divided (÷), square (^{2}), root ($\sqrt{\ }$) , Power (4^3 4 power 3), percent (%), less than (<), greater than (>),the absolute value (| |)

Keep in mind course 2

International System of Units

Bases quantity	Unit name	Symbol of unit
Length	meter	m
Mass	kilogram	kg
Time	Second	s
Temperature	kelvin	K
Amount of substance	Mole	mol
Electric current	Ampere	A
Luminous intensity	Candela	cd

Derived units, Example

Types of units	Physical quantity	Unit name	Symbol of unit
Derived units in terms of base units	Velocity, speed	meter/second	m/s
	acceleration	meter/square second	m/s^2
	area	Square meter	m^2
	Mass density	Kilogram/cubic meter	Kg/m^3
	volume	Cubic meter	m^3
Derived units with distinct name	force	newton	N
	pressure	pascal	Pa
	Energy,work	joule	J
	frequency	hertz	Hz
	power	watt	W

Base Quantities and Their Dimensions

Base quantity	Symbol for Dimension
Length	L
Mass	M
Time	T
Temperature	θ
Amount of substance	N
Electric current électrique	I
Luminous intensity	J

The dimension of any physical quantity can be written as:

$[Q]= L^a M^b T^c I^d \theta^e N^f J^g$ the dimensional equation of quantity Q

Dimensional Analysis Applications

Equation Verification: ensuring equations have consistent dimensions.
Unit Conversion: converting units between systems.
Relation Discovery: deriving connections between physical quantities.
Constant Dimensioning: finding the dimensions of constants.

Some rules for dimensional analysis

$A = B \Rightarrow [A] = [B]$
$A + B \Rightarrow [A] = [B]$
$A - B \Rightarrow [A] = [B]$
$A = C \cdot D \rightarrow [A] = [C][D]$
$A = C/D \rightarrow [A] = [C]/[D]$
The dimension of the radian is 1, if α is an angle hence, $[\alpha] = 1$

$$[\sin f] = [\cos f] = [\tan f] = [\ln f] = [\exp f] = \cdots = [f] = 1$$