Université Mohamed - KHIDER - BISKRA
Département de Génie Mécanique – MMC / Master – 2026/2027
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Travaux Dirigés (Série N° 1)

Exercise N° 1 :

For n=2 write the expression explicitly $S_1 = x_i y_i$.
For n=3 write the expression explicitly $S_2 = A_{ijk} B_{ij}$.
For n=2 write the expression explicitly $S_3 = a_{ijk} b_{ij} c_k$.

Exercise N° 2 :

Use the summation convention to write the following expressions, specifying the value of n in each case :

$A = a_{j1}\, x_1 + a_{j2}\, x_2 + a_{j3}\, x_3$
$B = b_{11}\, d_{11} + b_{12}\, d_{12} + b_{13}\, d_{13} + b_{14}\, d_{14}$
$C = C^1{}_{11} + C^2{}_{12} + C^3{}_{13} + C^4{}_{14} + C^5{}_{15}$

Exercise N° 3 :

Let $e_1(1,0,0)$, $e_2(0,1,0)$, $e_3(0,0,1)$ be a basis of R^3 ; we define the vectors A and B by:

$A = 4\, e_1 + 2\, e_2 + e_3$ $\qquad$ $B = 3\, e_1 - 5\, e_2 + 2\, e_3$

1°) determine the scalar product $(A \cdot B)$ of the vectors A and B.
2°) determine the vector product $(A \wedge B)$ of the vectors A and B.
3°) determine the tensor product $(A \otimes B)$ of the vectors A and B.
4°) determine the angle between the vectors A and B.

Same thing for vectors $A = (2, 1, 3)$ $\qquad$ $B = (1, 2, 4)$

Exercise N° 4 :

Show that : $I + (*n)^2 = {}^t(n)\,(n)$ $\qquad$ with $\qquad {}^t n = (n_1 , n_2 , n_3)$ a unit vector

Exercise N° 5 :

We consider the basis $\{f_j\}$ of R^3 defined by the following vectors:

$$f_1 = (1, 0, 0) \qquad f_2 = \left(\frac{1}{2}, \frac{3}{2}, 0\right) \qquad f_3 = \left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{3}}\right)$$

and the vector : $A = 8\, e_1 + 6\, e_2 + 3\, e_3$

1°) is the basis $\{f_j\}$ orthonormal ?
2°) determine the projections of vector A on the vector axes f_1 , f_2 et f_3 .
3°) determine the components of vector A in the basis (f_1 ,f_2 ,f_3).