

PHYSICS 201
4th HOMEWORK
Dr. V. Lempesis

Hand in: Tuesday 10th of December 2013

Student Name : _____

Student ID: _____

1. Let $\mathbf{u} = (4, 3, 2)$, $\mathbf{v} = (1, 4, 2)$, $\mathbf{w} = (1, 3, 2)$. a) Find that $\mathbf{u} \cdot (\mathbf{u} + \mathbf{v})$ and b) $\mathbf{u} \times (\mathbf{v} \times \mathbf{w}) = (\mathbf{u} \cdot \mathbf{w})\mathbf{v} - (\mathbf{u} \cdot \mathbf{v})\mathbf{w}$
2. Let $\mathbf{u} = (4, 3, 2)$, $\mathbf{v} = (1, 4, 2)$ find $\text{Proj}_{\mathbf{v}} \mathbf{u}$ and $\mathbf{u} - \text{Proj}_{\mathbf{v}} \mathbf{u}$.
3. Let $V = R^3 = \{(a, b, c) \mid a, b, c \in R\}$. Check if the following subset of R^3 is a vector subspace: $W_2 = \{(a, b, 1) \mid a, b \in R\}$.
4. Consider the vector space

$$M_{2 \times 3} = \left\{ \begin{pmatrix} a & b & c \\ d & e & f \end{pmatrix} \mid a, b, c, d, e, f \in R \right\}.$$

Show that the vectors

$$e_1 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}, e_2 = \begin{pmatrix} 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}, e_3 = \begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}$$

$$e_4 = \begin{pmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \end{pmatrix}, e_5 = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}, e_6 = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

are a base of the space.