

Introduction to Mechanical Engineering

Homework 1

Assigned: 1/28/13 Due: 2/1/13

Formulas

If $\vec{V} = V_x\hat{i} + V_y\hat{j} + V_z\hat{k}$ and $\vec{W} = W_x\hat{i} + W_y\hat{j} + W_z\hat{k}$, then

$$\vec{V} + \vec{W} = (V_x + W_x)\hat{i} + (V_y + W_y)\hat{j} + (V_z + W_z)\hat{k}$$

Dot Product Matrix

	\hat{i}	\hat{j}	\hat{k}
\hat{i}	1	0	0
\hat{j}	0	1	0
\hat{k}	0	0	1

If $\vec{V} = V_x\hat{i} + V_y\hat{j} + V_z\hat{k}$ and $\vec{W} = W_x\hat{i} + W_y\hat{j} + W_z\hat{k}$, then

$$\text{If } \vec{V} \cdot \vec{W} = V_xW_x + V_yW_y + V_zW_z$$

1. Add $2\hat{i} + 5\hat{j}$ to $-2\hat{i} - 5\hat{j}$.
2. Add $7\hat{j} - 4\hat{k}$ to $11\hat{j} + 3\hat{k}$.
3. Add $\hat{i} + \hat{j}$ to $\hat{j} + \hat{k}$.
4. Add $7\hat{i} + 2\hat{j} + 9\hat{k}$ to $3\hat{i} + 8\hat{j} + \hat{k}$.
5. Add $2\hat{i} + 2\hat{j} + 2\hat{k}$ to $2\hat{i} - 2\hat{j} + 2\hat{k}$.
6. What is the dot product between \hat{i} and \hat{j} ?
7. What is the scalar product between $\hat{i} + \hat{j}$ and \hat{j} ?
8. What is the inner product between \hat{i} and $\hat{i} + \hat{j}$?
9. Dot $2\hat{i} + 5\hat{j}$ and $-2\hat{i} - 5\hat{j}$.
10. Dot $7\hat{j} - 4\hat{k}$ and $11\hat{j} + 3\hat{k}$.
11. Dot $\hat{i} + \hat{j}$ and $\hat{j} + \hat{k}$.
12. Dot $7\hat{i} + 2\hat{j} + 9\hat{k}$ and $3\hat{i} + 8\hat{j} + \hat{k}$.
13. Dot $2\hat{i} + 2\hat{j} + 2\hat{k}$ and $2\hat{i} - 2\hat{j} + 2\hat{k}$.
14. Add $\hat{i} + 2\hat{j} + \hat{k}$ to $\hat{j} + \hat{k}$ and then dot the result with $3\hat{j} + 2\hat{k}$.

15. Dot $3\hat{j} + 2\hat{k}$ with $\hat{i} + 2\hat{j} + \hat{k}$, then dot $3\hat{j} + 2\hat{k}$ with $\hat{j} + \hat{k}$, then add the results.

16. Compare the results between 14 and 15. What is the general principle behind this statement?