Set #2 - for Wednesday October 9

Read RHK Ch.2 (2.1, 2.2, 2.3, 2.4)
K&K Ch.1 (1.5, 1.6, 1.8)
Feynman V.1 Ch1&Ch2

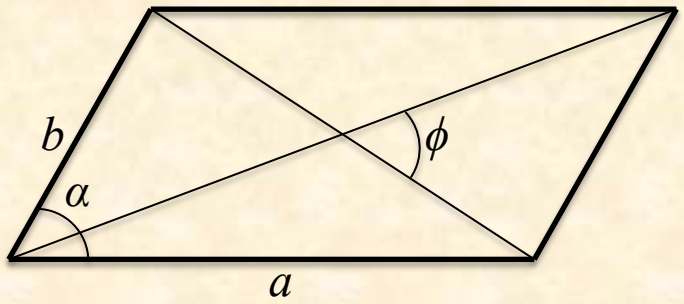
Solve

From RHK	Ch. 2	Problems 7, 8; Computer Problem 1
From K&K	Ch.1	Problems 1.2, 1.5, 1.6, 1.7, 1.8, 1.11

Problem 1. Three vectors are given by $\vec{a} = 3\hat{i} + 3\hat{j} - 2\hat{k}$, $\vec{b} = -\hat{i} - 4\hat{j} + 2\hat{k}$, $\vec{c} = 2\hat{i} + 2\hat{j} + \hat{k}$. Find (a) $\vec{a} \cdot (\vec{b} \times \vec{c})$, (b) $\vec{a} \cdot (\vec{b} + \vec{c})$, (c) $\vec{a} \times (\vec{b} + \vec{c})$. (d) See if you can find two scalars α and β so that $\vec{c} = \alpha\vec{a} + \beta\vec{b}$.

Problem 2. Use vector methods and find the angle between the body diagonals of a cube.

Problem 3. Find the angle ϕ defined by the two diagonals of a parallelogram of sides a and b, with $b < a$. The angle α is the angle between the two sides of the parallelogram, as shown below and it is given. (Use the scalar product to find ϕ).



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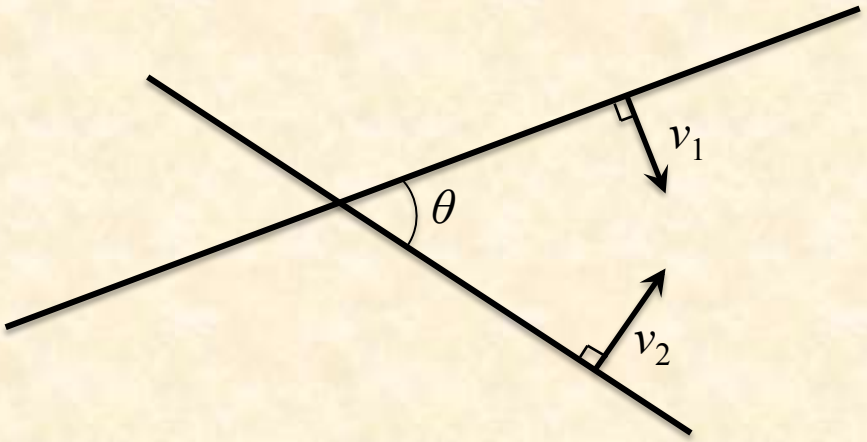
Problem 4. Given a fixed vector $\vec{a}$, find the equation of the surface described by the end points of all position vectors $\vec{r}$ such that $\vec{r}$ is perpendicular to the vector $\vec{r} - \vec{a}$. Express your answer as an equation relating *(x, y, z)*, the components of $\vec{r}$ in a convenient coordinate frame.

Problem 5. Two lines move with the speeds v_1 and v_2 in the directions parallel to the lines as shown below. The lines intersect at the angle θ. How fast is the point of intersection moving?



Good Luck, Dr. B