Physics CS 31 **Fall 2014**

Set #2 - for Wd Oct. 15

Read HR&K	Ch. 2 - Sects. 2.1, 2.2, 2.3, 2.4
Read K&K	Ch. 1 - Sects. 1.5, 1.6, 1.7, 1.8
Read Feynman Vol. 1	Ch. 1 & Ch. 2

From HR&K: Ch. 2 Problems 7

From K&K: Ch. 1 Problems 1.3, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.13.

1. Let N be an integer greater than 1. Consider the sum of N vectors of equal length, each vector making an angle of $2\pi/N$ with that preceding. Then show:

$$\cos 0 + \cos\frac{2\pi}{N} + \cos\frac{4\pi}{N} + ... + \cos(N-1)\frac{2\pi}{N} = 0$$

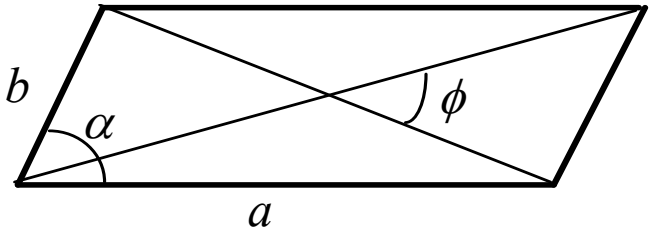
that is, $\sum_{n=0}^{N-1} \cos\frac{2\pi n}{N} = 0$

Also show: $\sum_{n=0}^{N-1} \sin\frac{2\pi n}{N} = 0$

2. 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 $\vec{c} = \alpha\vec{a} + \beta\vec{b}$.

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

4. 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).



5. 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.