

1. (10pts) Consider \vec{a} and \vec{b} two non-zero vectors in three dimensions. If the length of $\vec{a} + \vec{b}$ is the same as that of $\vec{a} - \vec{b}$, what properties must \vec{a} and \vec{b} have? Illustrate this with a figure, and find an expression for the length $\vec{a} + \vec{b}$.
2. (3,4,3pts) Sketch and give an equation describing all the points (in 3D) that are:
 - a) At an equal distance from the origin and the point $(0,0,3)$.
 - b) At a distance of 4 from the y -axis.
 - c) At a distance 3 from all the points on the sphere $(x-3)^2 + (y+4)^2 + z^2 = 9$.
3. (10pts) The eight sides of a regular octagon can be written as unit vectors placed head-to-tail and denoted by $\hat{u}_1, \hat{u}_2, \hat{u}_3, \hat{u}_4, \hat{u}_5, \hat{u}_6, \hat{u}_7$, and \hat{u}_8 . If $\hat{u}_1 = \hat{i}$ and $\hat{u}_3 = \hat{k}$, find the remaining six unit vectors.

ALSO

Bring three (3) *blank* green books to your TA, unless you have already done so. If you have already brought 3 green books to your TA, pat yourself on the back.