

Homework Set 1

DUE: JAN 19, 2017 (IN CLASS)

1. Write the equation for the sphere of radius 4 centered at $(1, 2, 3)$. Is the origin $\vec{0}$ inside or outside this sphere?
2. Given vectors $\vec{v} = (1, 0, -1)$ and $\vec{w} = (0, 2, 2)$, find the coordinates and the length of the vectors $\vec{a} = \vec{v} + \vec{w}$, $\vec{b} = 2\vec{v} - 3\vec{w}$, and $\vec{c} = -2\vec{v} + \vec{w}$.
3. Suppose that three people are pulling unit length ropes that are tied together forming a Y shape. Assume that each of them pulls with the same strength, so the configuration does not move. Write down the 2D vectors \vec{F}_1 , \vec{F}_2 , and \vec{F}_3 that represent the forces exerted on the point where the ropes are tied (which we assume is the center of mass of the system).

HINT: Choose coordinates x, y such that the center point is at the origin, and \vec{F}_1 is parallel to the x -axis, that is, $\vec{F}_1 = (|\vec{F}_1|, 0)$.

4. Find x such that the vectors $(x, -x, 1)$ and $(2, x, -1)$ are orthogonal. Are there values of x for which each of these vectors is unit, not necessarily at the same time?
5. The set of points equidistant from the points $(2, -1, 1)$ and $(4, 3, -5)$ is a plane. Find real numbers a, b, c , and d , such that $ax + by + cz + d = 0$ is the equation of this plane.