

HOMEWORK 1, DUE WEDNESDAY, JANUARY 20TH IN CLASS.

- (1) Find the center and radius of the sphere $x^2 + y^2 + z^2 = x + y + z$.
- (2) Find the largest sphere contained in the first octant (i.e. $x \geq 0, y \geq 0, z \geq 0$) with center $(5, 4, 3)$.
- (3) Compute the sum of the vectors $(-1, -1)$ and $(2, 3)$, and illustrate this sum geometrically.
- (4) Find the angle between the vectors $(0, 1, 1)$ and $(1, 0, 1)$.
- (5) Find a unit vector that is orthogonal to both $\vec{i} + \vec{j}$ and $\vec{i} + \vec{k}$.
- (6) For $\vec{a} = (1, 0, 0)$, $\vec{b} = (1, 1, 0)$, and $\vec{c} = (1, 1, 1)$, compute the following quantities if they have meaningful answers.
 - (a) $\vec{a} \times (\vec{b} \times \vec{c})$
 - (b) $(\vec{a} \cdot \vec{b}) \times (\vec{a} \cdot \vec{c})$
 - (c) $(\vec{a} \cdot \vec{b}) \vec{c}$
 - (d) $(\vec{a} \times \vec{b}) \cdot (\vec{a} \times \vec{c})$
 - (e) $\vec{a} \cdot (\vec{b} \times \vec{c})$
 - (f) $\vec{a} \times (\vec{b} \cdot \vec{c})$
- (7) Find an implicit equation for the plane that contains the point $(2, 0, -1)$ and which has normal vector $2\vec{j} + \vec{k}$.
- (8) Find an implicit equation for the plane that contains the points $(1, 1, 0)$, $(1, 0, 1)$, and $(0, 1, 1)$.
- (9) Compute the projection of the vector $(1, 1, 1)$ onto the direction of the vector $(2, 0, 0)$.