HW #1

Question 1.

(1) Let P be the point $(r, \theta) = (\sqrt{3}, \frac{\pi}{4})$, given in polar coordinates.
Find the rectangular coordinates (in 2D) of the point P.
(2) Let Q be the point $(x, y, z) = (-\sqrt{3}, -3, \sqrt{3})$, given in rectangular coordinates (in 3D).
Find the cylindrical coordinates of the point Q.
(3) Let R be the point $(x, y, z) = (-3, \sqrt{3}, -2\sqrt{3})$, given in rectangular coordinates (in 3D).
Find the spherical coordinates of the point R.

Question 2. Let $A = (-2, 2)$ and $B = (2, -1)$. Find the components of the vector $\overrightarrow{AB}$, its length, and the unit vector in the same direction.

Question 3. Find the values of s, t such that

$$\vec{u} + \vec{v} = \vec{0}$$

holds, provided that the vectors $\vec{u}$ and $\vec{v}$ are given by

$$\vec{u} = \langle t - 2s - 1, 3s - t \rangle$$
$$\vec{v} = \langle t - 5, 2t + s - 3 \rangle$$

Question 4. Let $\vec{u} = \vec{v} - (2\vec{w} + \vec{v})$, where $\vec{v}$ and $\vec{w}$ are the vectors given by

$$\vec{v} = 3\vec{i} - 4\vec{j} - 9\vec{k}$$
$$\vec{w} = -\vec{i} + 2\vec{j} - 2\vec{k}$$

Find the components of the vector $\vec{u}$, and its length.