

Answers to Quiz 1

Math 230. Friday, 9/8/6

Problem 1 (75%) Evaluate: $\langle 1, 0, -2 \rangle + |\vec{a}| \langle 2, 1, -1 \rangle = ?$, where $\vec{a} = \langle -1, -1, \sqrt{2} \rangle$.

$|\vec{a}|$ is a real number, the length of the vector \vec{a} . The length of a vector $\langle x, y, z \rangle$ is $\sqrt{x^2 + y^2 + z^2}$. Therefore, $|\vec{a}| = \sqrt{(-1)^2 + (-1)^2 + (\sqrt{2})^2} = \sqrt{4} = 2$. So $|\vec{a}| \langle 2, 1, -1 \rangle = 2 \langle 2, 1, -1 \rangle = \langle 4, 2, -2 \rangle$, and therefore $\langle 1, 0, -2 \rangle + |\vec{a}| \langle 2, 1, -1 \rangle = \langle 1, 0, -2 \rangle + \langle 4, 2, -2 \rangle = \langle 5, 2, -4 \rangle$.

Problem 2 (25%) Which coordinate planes and which coordinate axes are intersected by the segment with endpoints $(1, 2, 2)$ and $(1, -2, -2)$?

There are three coordinate axes (the x -axis, the y -axis and the z -axis) and three coordinate planes (the xy -plane, the xz -plane and the yz -plane).

Answer: the x -axis and the xy - and xz -coordinate planes.

All of them are intersected by this segment in the point $(1, 0, 0)$, which is the midpoint of the segment, because $(1, 0, 0) = \left(\frac{1+1}{2}, \frac{2+(-2)}{2}, \frac{2+(-2)}{2}\right)$. The x -axis consists precisely of the points (x, y, z) satisfying $y = z = 0$, and thus contains the point $(1, 0, 0)$. The xy -coordinate plane is given by the equation $z = 0$, and the xz -coordinate plane is given by the equation $y = 0$, so both of them contain the point $(1, 0, 0)$.