Homework #7

Problem 3:

If $\vec{B} \neq 0$ and $\vec{E} = 0$ in K, we know that

$$2(E^2 - B^2) = 2(E'^2 - B'^2)$$

$$2(B^2 - E^2) = 2(B'^2 - E'^2)$$

$$\vec{E}.\vec{B} = \vec{E}'.\vec{B}'$$

In our case

$$-2B^2 = 2(E'^2 - B'^2)$$

$$2B^2 = 2(B'^2 - E'^2)$$

$$0 = \vec{E}'.\vec{B}'$$

We see that in any system K' the fields $\vec{E}'$ and $\vec{B}'$ must be orthogonal to each other. We also see that $B^2 > E^2$ in all reference systems.