1. [10 pts] Laboratory scientists have created the electric and magnetic fields shown below. These fields are also seen by scientists that zoom past in a rocket traveling in the +x-direction at a speed of \(1.0 \times 10^6\) m/s.  

Note that \(c = 3.0 \times 10^8\) m/s, and  
\[
\cos 45^\circ = \sin 45^\circ = \frac{\sqrt{2}}{2}
\]

a. [5 pts] According to the rocket scientists, what is the magnetic field expressed as a vector in x, y, and z components?

\[
\vec{B}' = \vec{B} - \vec{v} \times \vec{E} + \frac{c^2}{v^2} \vec{E}
\]

b. [5 pts] According to the rocket scientists, what is the electric field expressed as a vector in x, y, and z components?

Using Galilean transformation for Electric field we have

\[
\vec{E}' = \vec{E} + \vec{v} \times \vec{B} - \frac{c^2}{v^2} \vec{E}
\]

\[
E' = 1.0 \times 10^6 \frac{V}{m}
\]

\[
\vec{B}' = \frac{1.0 \times 10^6 \text{m} \cdot \text{s}}{\text{m}} \left( \hat{i} + \frac{\sqrt{2}}{\sqrt{2}} \hat{j} \right) + \frac{1.0 \times 10^6 \text{m} \cdot \text{s}}{\text{m}} \left( \hat{k} + \frac{\sqrt{2}}{\sqrt{2}} \hat{j} \right) + \frac{1.0 \times 10^6 \text{V} \cdot \text{m}}{\text{m}} \left( \hat{i} + \frac{\sqrt{2}}{\sqrt{2}} \hat{j} \right)
\]

\[
\Theta = 45^\circ
\]