PHYS 703 - Magnetic fields.

1. Consider each of the following magnetic fields:
   $B_0\hat{r}$, $B_0\mathrm{cosec}(\theta)\hat{\theta}$, $B_0\hat{\phi}$, and $B_0\hat{k}$.
   In each case:

   (i) Explain why such a field is possible or impossible.

   (ii) If the magnetic field is possible, specify a vector potential which gives rise to the field.

   (iii) If the magnetic field is possible, specify a current distribution which gives rise to the vector potential.

   (iv) If the magnetic field is possible, specify the magnetic moment or magnetization of the current distribution.

   (v) If the magnetic field is possible, specify at least one non-trivial gauge transformation which leaves the magnetic field unchanged.