A thin wire carries a uniform current I. This current produces a magnetic field, **B**. Up until now, you've always been told that magnetic fields loop around a current-carrying wire (Figure a. below), but how do you know that there are not other components to the magnetic field? Perhaps the magnetic field has a z-component (Figure b.) or a radial component (Figure c.).
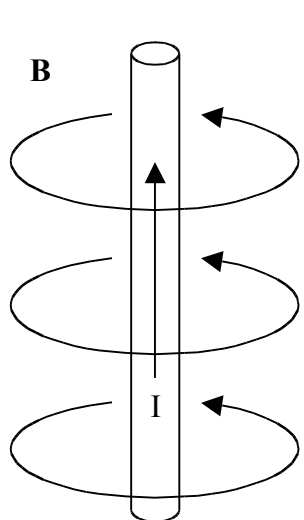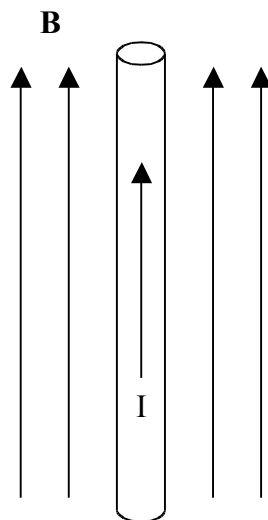

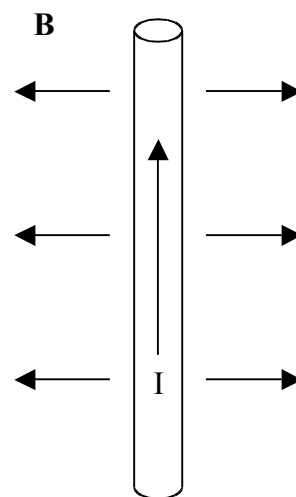| Figure a. | Figure b. | Figure c. |

i. Can you think of any convincing arguments for why there shouldn't be a z- or s-component? It might be useful to consider symmetry, Maxwell's equations, boundary conditions (e.g. at infinity?) and any laws that have recently been covered in class.