Navigating in a Magnetic World!

The figure above shows three magnetic field lines in space. The three arrows show the direction that a compass needle will point in the magnetic north direction. The X-axis lies along the west-east direction with east towards the right. The Y-axis lies along the geographic north-south direction with north at the top.

**Problem 1** – Describe what happens to the compass needle as a spacecraft moves from point (+6.2, 0) to (+6.2, +5.0) to (+6.2, +8.0).

**Problem 2** - Draw a possible spacecraft path so that the compass needle always points to geographic west in the figure.

**Problem 3** – A satellite is launched from point (+1.0, +2.0) and travels horizontally to point (+10.0, +2.0). Plot a graph that shows how its instruments will record the direction changes of the magnetic field as it travels. At what location is the magnetic field pointed due-west? (Note: You may approximate angle measurements by interpolation as needed.)

Space Math http://spacemath.gsfc.nasa.gov
Problem 1 – Describe what happens to the compass needle as a spacecraft moves from point (+6.2, 0) to (+6.2, +5.0) to (+6.2, +8.0).

Answer: First the compass needle points vertically due-North, then it points 45 degrees west of north, then it points due-west!

Problem 2 - Draw a possible spacecraft path so that the compass needle always points to geographic west in the figure.

Problem 3 – A satellite is launched from point (+1.0, +4.0) and travels horizontally to point (+10.0, +4.0). Plot a graph that shows how its instruments will record the direction changes of the magnetic field as it travels. At what location is the magnetic field pointed due-west? (Note: You may approximate angle measurements by interpolation as needed.)

To point due-west, the angle must be 180 degrees. From the graph this happens when the satellite is close to x=+4.0, so its coordinate on its path is (+4.0, +4.0)