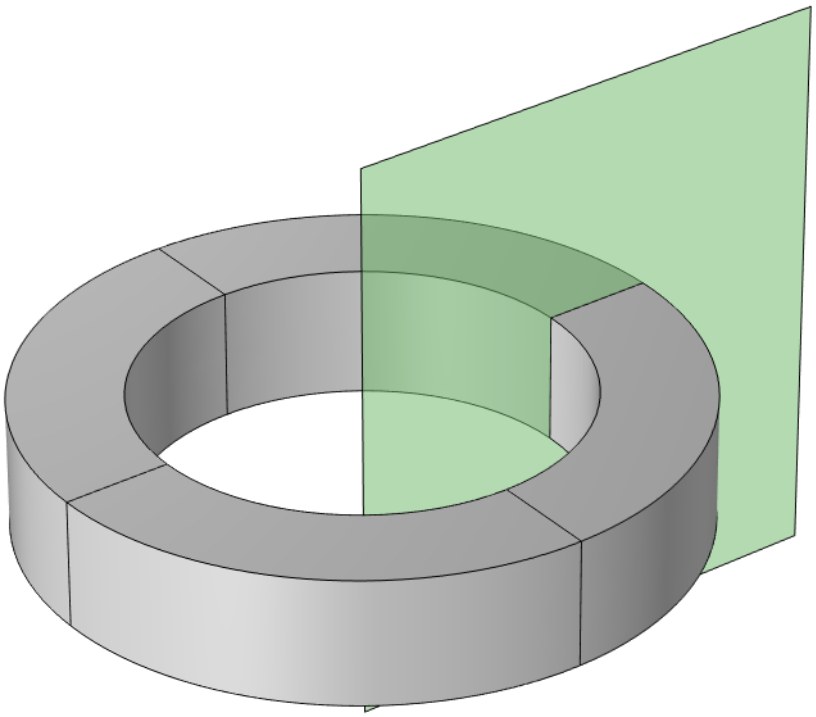
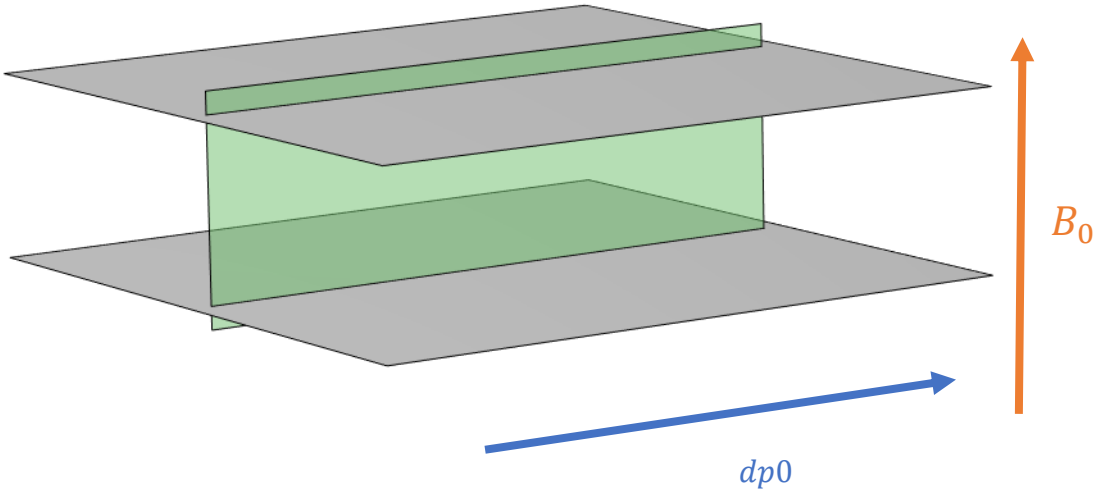
Solutions to the exercise:

1) The geometry and physics is rotationally symmetric. The fluid flow will be azimuthal – out-of-plane for a 2D axisymmetric model - but it is driven by a force, so it can be handled via the swirl force options. A 2D axi-symmetric model can then be used. The current is in the radial in-plane direction so the Magnetic and Electric Fields interface is used with the Laminar Flow interface.



2) The geometry and physics is translationally invariant. A 2D cross-section model can be used. The cross-section plane must have the flow in-plane. The induced current is then in the out-of-plane direction. The Magnetic Fields interface can then be used with the Laminar Flow interface.



3) The system is not rotationally or translationally invariant. It must be solved in 3D, using the Magnetic and Electric Fields interface with the Laminar Flow interface.