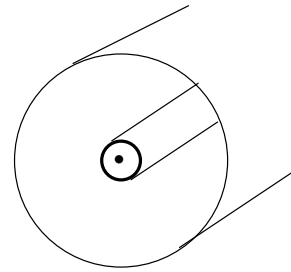


## Problem 20.4

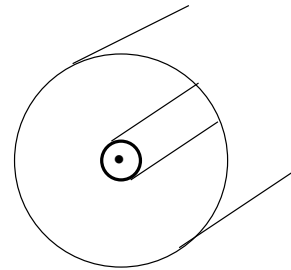
A long, straight, current-carrying wire resides along the central axis of a cylinder. What is the magnetic flux through the cylinder.



1.

## Problem 20.4

A long, straight, current-carrying wire resides along the central axis of a cylinder. What is the magnetic flux through the cylinder.



This is a bit of a trick question. The magnetic field lines of the wire will circle around the wire. The surface of the cylinder will also circle around the wire. As no magnetic field lines will pass THROUGH the cylinder, the magnetic flux through the cylinder will be zero!

Mathematically, the B-field lines will be parallel to the cylinder's surface while the area vector is perpendicular to the surface. When you do the dot product, the angle between the two is 90 degrees and the cosine of that angle is zero.

2.