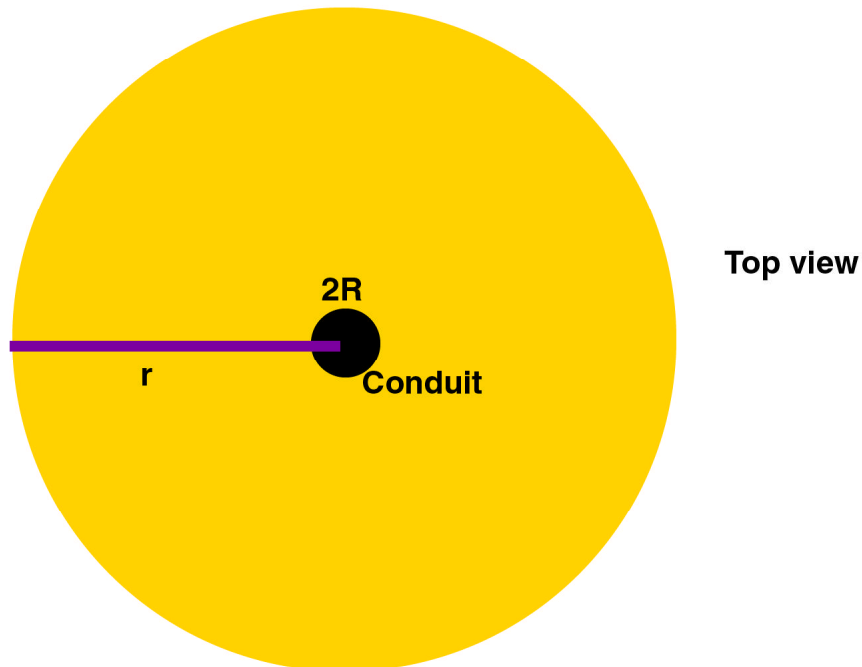


Geophysics 150: Home set due Oct. 16, 2002

2. Use parameters from question 1. Real Arctic hot springs are a few degrees Celcius. The water ascebds through cylindrical conduits. Let the conduit have an effective radius R of 0.1 m. The actual conduit is a zone of cracks.

a. A time of R^2/κ is needed for the region around the conduit to come into steady state. Use specific heat given for water for the rock. Obtain the time.



b. After a time t the temperature anomaly has moved out a distance r from the conduit center. Assuming that the conduit radius may be considered small. Dimensionally obtain the horizontal heat flow from the conduit. The conduit temperature is 5°C and the surrounding temperature is on average -20°C .

c. Now obtain the heat flow per length of conduit by integrating around the circumference. Does the heat flow depend on time (and on r) with the assumptions in part b?