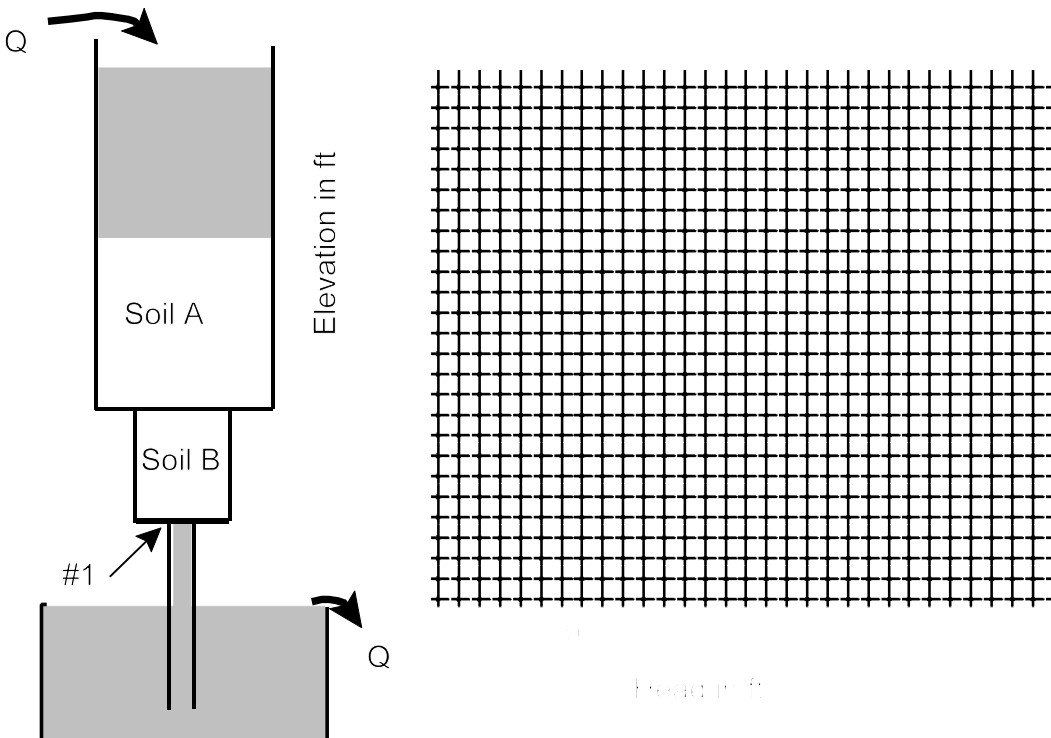


Homework Set #3
HWR 535 Advanced Subsurface Hydrology
 Department of Hydrology and Water Resources
 The University of Arizona, Tucson Arizona
 (Yeh)

1. Determine and plot the pressure, elevation, and total heads in the apparatus shown below as a function of elevation.

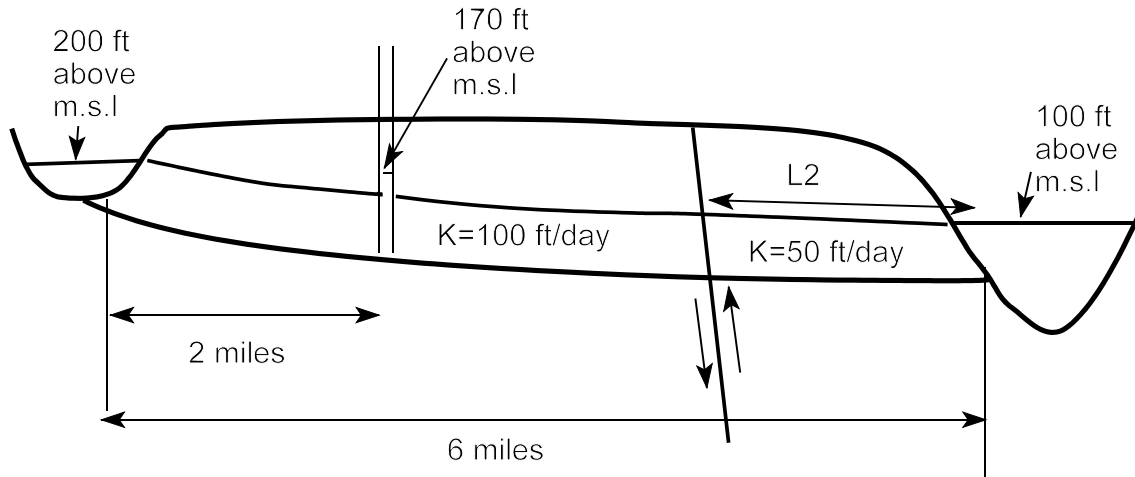


Properties of the apparatus.

Item	Soil A	Soil B
Cross-sectional Area (A)	4 ft ²	2 ft ²
Porosity (n)	1/2	1/3
Hydraulic conductivity (K)	2 ft/min	1 ft/min

Why is the pressure at point #1 negative? Does it mean the point is unsaturated? Is a ceramic plate needed at the point and why?

2. A confined aquifer receives water from a lake and discharges into an adjacent river valley as shown in Figure 1. The aquifer was truncated due to a normal fault so that the upstream portion of the aquifer has a hydraulic conductivity K_1 , 100 ft/day, and the downstream portion has a lower hydraulic conductivity $K_2 = 50$ ft/day. Given that the aquifer thickness is 50 ft., calculate (A) the rate flow into the aquifer from the lake per unit length of shore line.(B) the length of the low conductivity portion of the aquifer, L_2 .



3 Consider uniform, steady, horizontal flow in a porous medium that is anisotropic with respect to hydraulic conductivity. The matrix representation of the hydraulic conductivity tensor with respect to the $x - y$ system (shown below) is given by $K_{xx} = 10$ cm/sec, $K_{xy} = K_{yx} = 3$ cm/sec, $K_{yy} = 2$ cm/sec. A tracer test shows that the groundwater velocity is 0.0046 cm/sec. in the direction $N66.4^\circ E$, and the porosity of the medium is 0.38. Determine the direction and magnitude of the hydraulic gradient. What are the principal directions of the anisotropic porous media?

