1. Empirical relationships for the formation resistivity factor have the form,
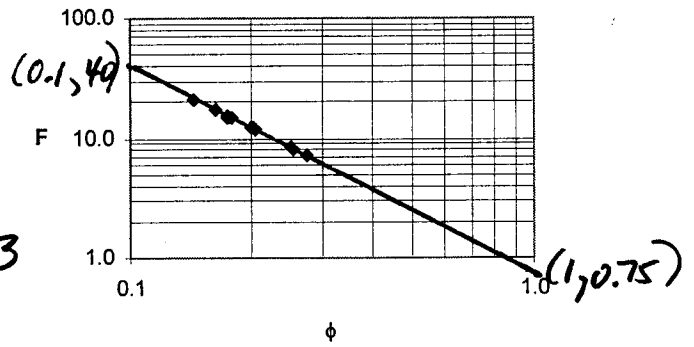
$$F = R_o/R_w = a\phi^{-m}.$$

Determine the value of a and m from the data graphed at right.
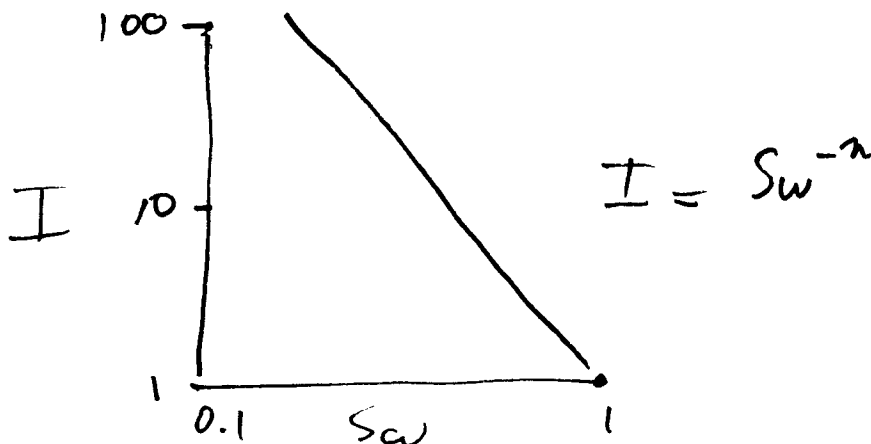
Formation Factor vs Porosity

$$Slope = \frac{\log\left(0.75/40\right)}{\log \frac{1}{0.1}} = -1.73$$

$$\Rightarrow \quad a = 0.75$$
$$m = 1.73$$

2. Sketch the relationship between resistivity index, $I = R_t/R_o$, and water saturation.

$$I = Sw^{-\lambda}$$

3. Calculate S_w from resistivity data, given $R_w = 0.04$ Ω-m, $R_t = 10$ Ω-m, $a = 1$, $\phi = 0.25$, and m & n = 2. HINT: Eliminate R_o in the above relationships.

from (1) $\quad R_o = R_w \, a \, \phi^{-m}$

from (2) $\quad R_o = R_t \, S_w^{\,n} \quad \Rightarrow \quad S_w = \sqrt[n]{\dfrac{R_w \, a}{R_t \, \phi^m}}$

$$S_w = \sqrt[2]{\frac{(0.04)(1)}{(10)(0.25)^2}} = 0.253$$