Exercise 3

3.The following data are available for a linear-reservoir system:

Bo=1.25 bbl/STB ， Bw=1.02 bbl/STB ， h = 20 ft ， A = 26400 ft， Porosity = 25%

Injection rate i_w = 900 bbl/day，distance between producer and injector L=600 ft，

u_o=2.0 cp，u_w =1.0 cp，Dip angle = 0° ， S_{wi}=20% ， S_{or} = 20%

Seek for:

(1)Plot the water saturation profile after 60, 120, and 240 days.

(2)Calculate time to breakthrough?

(3)Calculate cumulative water injected at breakthrough?

(4)Calculate total pore volumes of water injected at breakthrough?

S_w	kro/krw
0.25	30.23
0.30	17.00
0.35	9.56
0.40	5.38
0.45	3.02
0.50	1.70
0.55	0.96
0.60	0.54
0.65	0.30
0.70	0.17
0.75	0.10

$$\frac{df_w}{dS_w}=\frac{\left(\frac{\mu_w}{\mu_o}\right)bae^{-bS_w}}{\left[1+\left(\frac{\mu_w}{\mu_o}\right)ae^{-bS_w}\right]^2}=\frac{\left(\frac{\mu_w}{\mu_o}\right)b\left(\frac{K_{ro}}{K_{rw}}\right)}{\left[1+\left(\frac{\mu_w}{\mu_o}\right)\left(\frac{K_{ro}}{K_{rw}}\right)\right]^2}$$

Note：

The frontal advance equation：

$$(x)_{s_w}=\frac{q_t t}{\phi A}\left(\frac{\partial f_w}{\partial S_w}\right)_{Sw}$$

In field units, the above equation can be expressed as:

$$(x)_{S_w}=\left(\frac{5.615 i_w t}{\phi A}\right)\left(\frac{df_w}{dS_w}\right)_{S_w}$$