

$$q_o = \frac{2\pi k h (P_e - P_{wf})}{(\mu_o B_o)_{P_{av}} \left[\ln\left(\frac{r_e}{r_w}\right) - 0.5 \right]}$$

SI system

- steady-state
- vertical well, fully perforated
- undersaturated oil
- radial drainage volume
- homogeneous permeability

$$\left[\frac{\text{m}^3}{\text{s}} \right] = \frac{\left[\text{m}^2 \right] \left[\text{m} \right] \left[\text{Pa} \right]}{\left[\text{Pa} \cdot \text{s} \right] \left[- \right]}$$

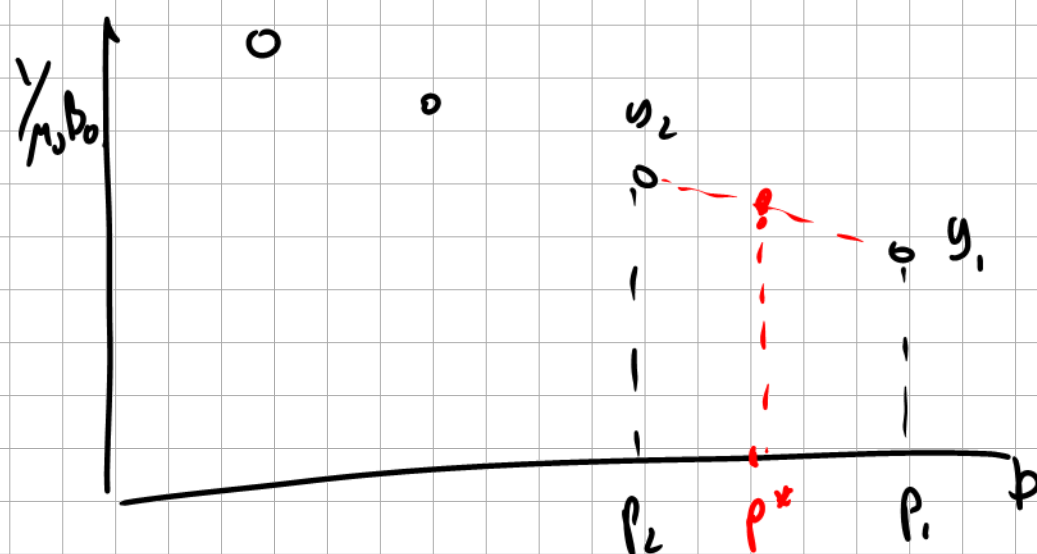
$$\left[\frac{\text{m}^3}{\text{d}} \cdot \frac{1 \text{ d}}{24 \text{ h}} \cdot \frac{1 \text{ h}}{3600 \text{ s}} \right] = \frac{\left[1 \text{ md} \cdot \frac{1 \text{ d}}{1000 \text{ md}} \cdot \frac{9.865 \cdot 10^{-13} \text{ m}^2}{1 \text{ d}} \right] \left[\text{m} \right] \left[\text{bar} \cdot \frac{10^5 \text{ Pa}}{1 \text{ bar}} \right]}{\left[1 \text{ cp} \cdot 10^{-3} \text{ Pa} \cdot \text{s} \right] \left[1 \text{ cp} \right]} \cdot \pi$$

$$= \frac{1}{18.68}$$

$$q_o = \frac{k h (P_e - P_{wf})}{(\mu_o B_o)_{P_{av}} \left[\ln\left(\frac{r_e}{r_w}\right) - 0.5 \right]} \cdot \frac{1}{18.68}$$

P in bar
 k in md
 μ_o in cp
 $q_o = \text{m}^3/\text{d}$

$$J = \frac{k h}{(\mu_o B_o)_{av} \left[\ln\left(\frac{r_e}{r_w}\right) - 0.5 \right] \cdot 18.68}$$



$$\frac{y_2 - y_1}{p_2 - p_1} = \frac{y_2 - y^*}{p_2 - p^*}$$

$$y = \frac{1}{\mu_o B_o}$$

VBA visual basic for application

while in excel press alt + F11

Microsoft Visual Basic for Applications - [Module1 (Code)]

File Edit View Insert Format Debug Run Tools Add-Ins Window Help

Ln 1, Col 1

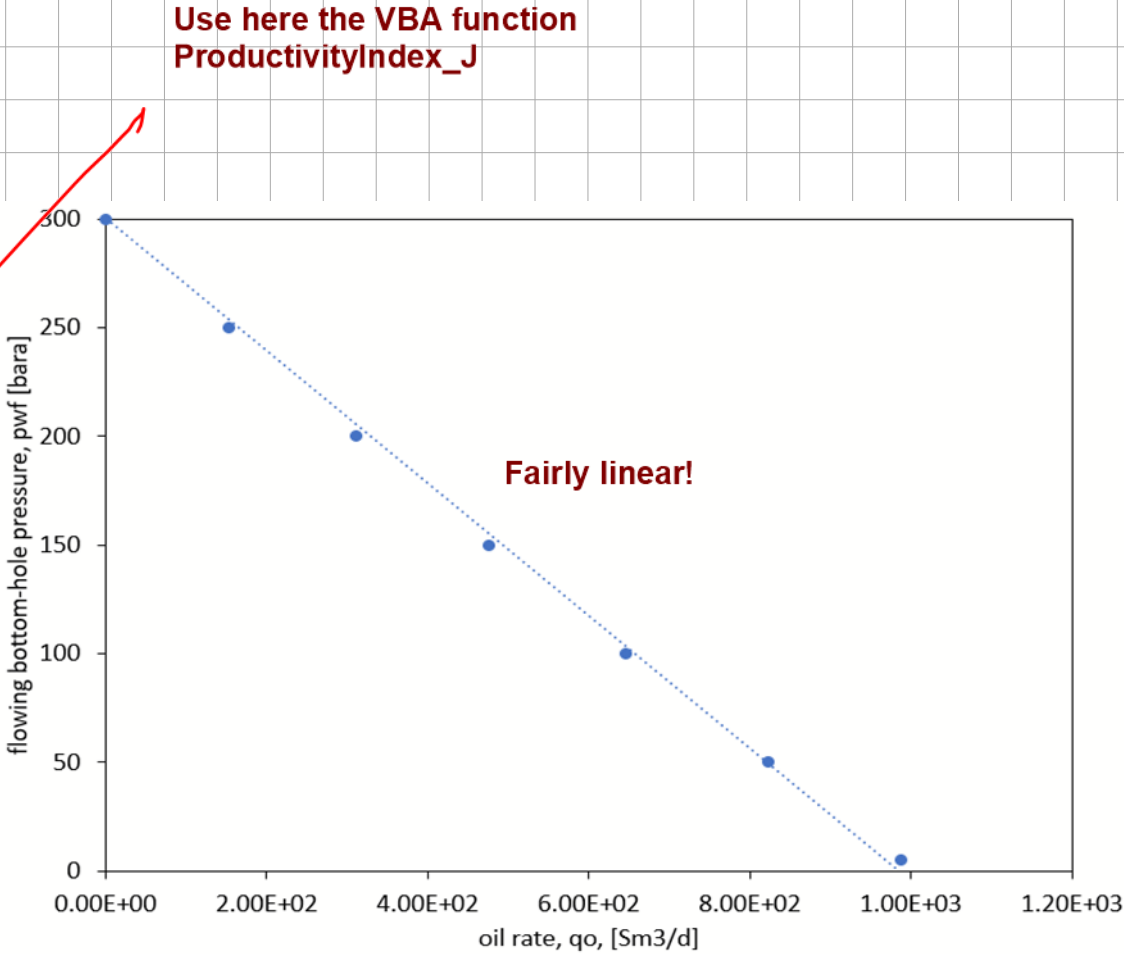
Project - VBAProject

(General)

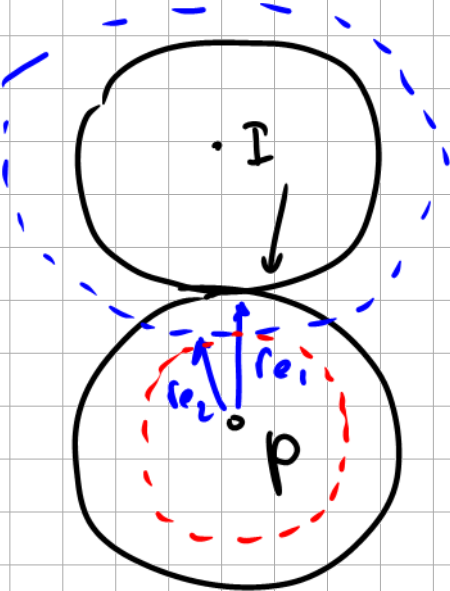
```
Function tabinterpol(x, col, Matrix As Range)
'function to perform linear interpolation in tables
'INPUT:
'-x value for which the value is required
'-col: column number in which the property is located
'Matrix: table organized in the following manner:
'  col1 col2 col3 col4
'x1 P11
'x2
'x3
'.'
'All numbers, no strings!!!
'arranged in ascending order of x, i.e. x1<x2<x3, etc.
'Reading the dimensions of the table
'Number of rows
m = Matrix.Rows.Count
'Number of columns
```

r _e	[m]	500
r _w	[m]	0.1
k	[md]	10
h	[m]	100
p _R	[bara]	300

	pwf	pav	1/(Bo visco)	J	qo
	[bara]	[bara]	[1/(cp*m3/Sm3)]	[Sm3/d/bar]	[Sm3/d]
	300	300	0.449	3.0	0.00E+00
	250	275	0.457	3.1	1.53E+02
	200	250	0.465	3.1	3.11E+02
	150	225	0.474	3.2	4.75E+02
	100	200	0.483	3.2	6.46E+02
	50	175	0.493	3.3	8.23E+02
	5	153	0.502	3.3	9.88E+02



EFFECT OF THE BOUNDARY (re)



EFFECT OF THE REGIME (SS)

r _e	[m]	500
r _w	[m]	0.1
k	[md]	10
h	[m]	100
p _R	[bara]	300

$\ln\left(\frac{r_e}{r_w}\right) = 8.52E+00$

$$J = \frac{kh}{18.68 (h_o b_o)_{av} \cdot \left(\underbrace{\ln \frac{r_e}{r_w}}_{8.5} - \underbrace{0.5}_{10\%} \right)}$$

SS, boundary effect

r _e	[m]	500
r _w	[m]	0.1
k	[md]	10
h	[m]	100
p _R	[bara]	300

	pwf	pav	1/(Bo visco)	J	qo
	[bara]	[bara]	[1/(cp*m3/Sm3)]	[Sm3/d/bar]	[Sm3/d]
	300	300	0.449	3.0	0.00E+00
	250	275	0.457	3.1	1.53E+02
	200	250	0.465	3.1	3.11E+02
	150	225	0.474	3.2	4.75E+02
	100	200	0.483	3.2	6.46E+02
	50	175	0.493	3.3	8.23E+02
	5	153	0.502	3.3	9.88E+02

r _e	[m]	400
r _w	[m]	0.1
k	[md]	10
h	[m]	100
p _R	[bara]	300

	pwf	pav	1/(Bo visco)	J	qo
	[bara]	[bara]	[1/(cp*m3/Sm3)]	[Sm3/d/bar]	[Sm3/d]
	300	300	0.449	3.1	0.00E+00
	250	275	0.457	3.1	1.57E+02
	200	250	0.465	3.2	3.20E+02
	150	225	0.474	3.3	4.89E+02
	100	200	0.483	3.3	6.64E+02
	50	175	0.493	3.4	8.46E+02
	5	153	0.502	3.4	1.02E+03