

PETE - 324

HOMEWORK #3 - SOLUTION

2005

Tubing Length,  $L = 8500$  ft

Tubing I.D. = 2.44 inch

I. Wellbore Volume,  $V_w$ :

$$V_w = \pi \left( \frac{\text{I.D.}}{2} \right)^2 L = \pi \left( \frac{2.44 \text{ inch}}{2} \times \frac{1 \text{ ft}}{12 \text{ inch}} \right)^2 8500 \text{ ft}$$

$$V_w = 276.01 \text{ ft}^3$$

II. Porosity of Wellbore cell with wellbore storage, PHIS:

$$\text{PHIS} = \frac{V_w}{\pi (R_R^2 - R_{WE}^2) \text{ DELY}} = \frac{276.01 \text{ ft}^3}{\pi (0.25^2 - 0.001^2) 150 \text{ ft}}$$

$$\text{PHIS} = 9.372$$

III. Permeability of cell on damaged zone,  $k_s$ :

$$S = \left( \frac{k}{k_s} - 1 \right) \ln \left( \frac{r_s}{r_w} \right)$$

$$10.5 = \left( \frac{4}{k_s} - 1 \right) \ln \left( \frac{4.11}{0.25} \right)$$

$$\frac{4}{k_s} = \frac{10.5}{\ln \left( \frac{4.11}{0.25} \right)} + 1$$

$$k_s = 0.842 \text{ md}$$

CASE C:\Documents and Settings\Satelle\Desktop\Thesis\HW3\_WBS&skin.dat

CMNT Homogeneous Cylindrical Reservoir  
 CMNT Radial Flow, Constant-rate production, Infinite-acting  
 CMNT Slightly Compressible Fluid  
 CMNT Wellbore is modeled by the first cell to show wellbore storage.  
 CMNT  
 CMNT Single Value Input Data  
 IMAX 30  
 JMAX 1  
 RWEL 0.001  
 CROC 0.000144 rock plus oil compressibility for CNST case  
 SWAT 0.2  
 CWAT 0.000003  
 PREF 3000  
 NEWT 1  
 BETA 0  
 CMNT Bo, ref/scf viscosity cp  
 CNST 1.1 0.72  
 END  
 CMNT Grid Input Data  
 CMNT Geometrically spaced grid system  
 CMNT b = 1.49  
 CMNT The actual value of rw is assigned to the first cell  
 RR -1  
 0.25 0.372973876 0.55643805 0.83014743 1.238493214 1.84770246 2.756578994 4.11252781 6.135462 9.153467824  
 13.65601751 20.37335114 30.394911 45.3460311 67.65154003 100.929029 150.575564 224.643007 335.1439 499.9996674  
 550 600 650 700 750 800 850 900 950 1000  
 DELY 150  
 KX 4  
 KY 4  
 PHI 0.23  
 POI 3000  
 CMNT Gridblock 1 is for wellbore storage  
 WIND 1 1 1 1

$$C_g = C_g + S_o C_o + S_w C_w$$

$$= (14.4 + 0 + 0.2(3)) \times 10^{-6}$$

$$= 15.0 \times 10^{-6}$$

PHIS 9.37

KX 1000000

KY 1000000

CMNT Gridblocks 2 through 8 have a reduced permeability, representir well damage

WIND 2

KX 0.842

KY 0.842

END

CMNT Schedule Data location skin

CMNT Well No. i - 0 location

NAME 1 1 1

CMNT Well No. scf/D

QG 1 561.5

ALPH 1.2

DELT 0.0001

DTMX 50

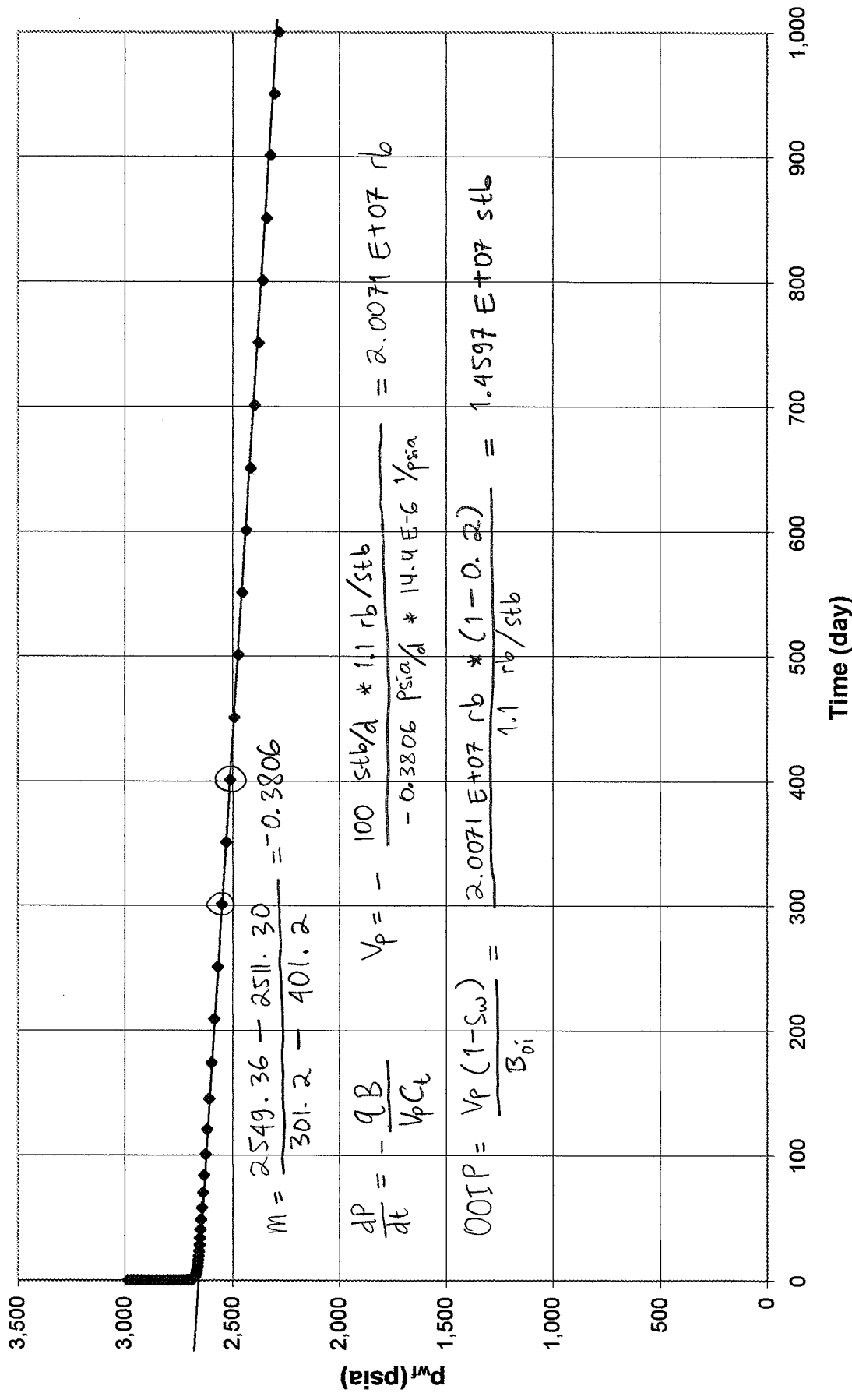
WELL 1

PWAP 2

TIME 1000

END

Plot ( $p_{wf}$  vs. Time)

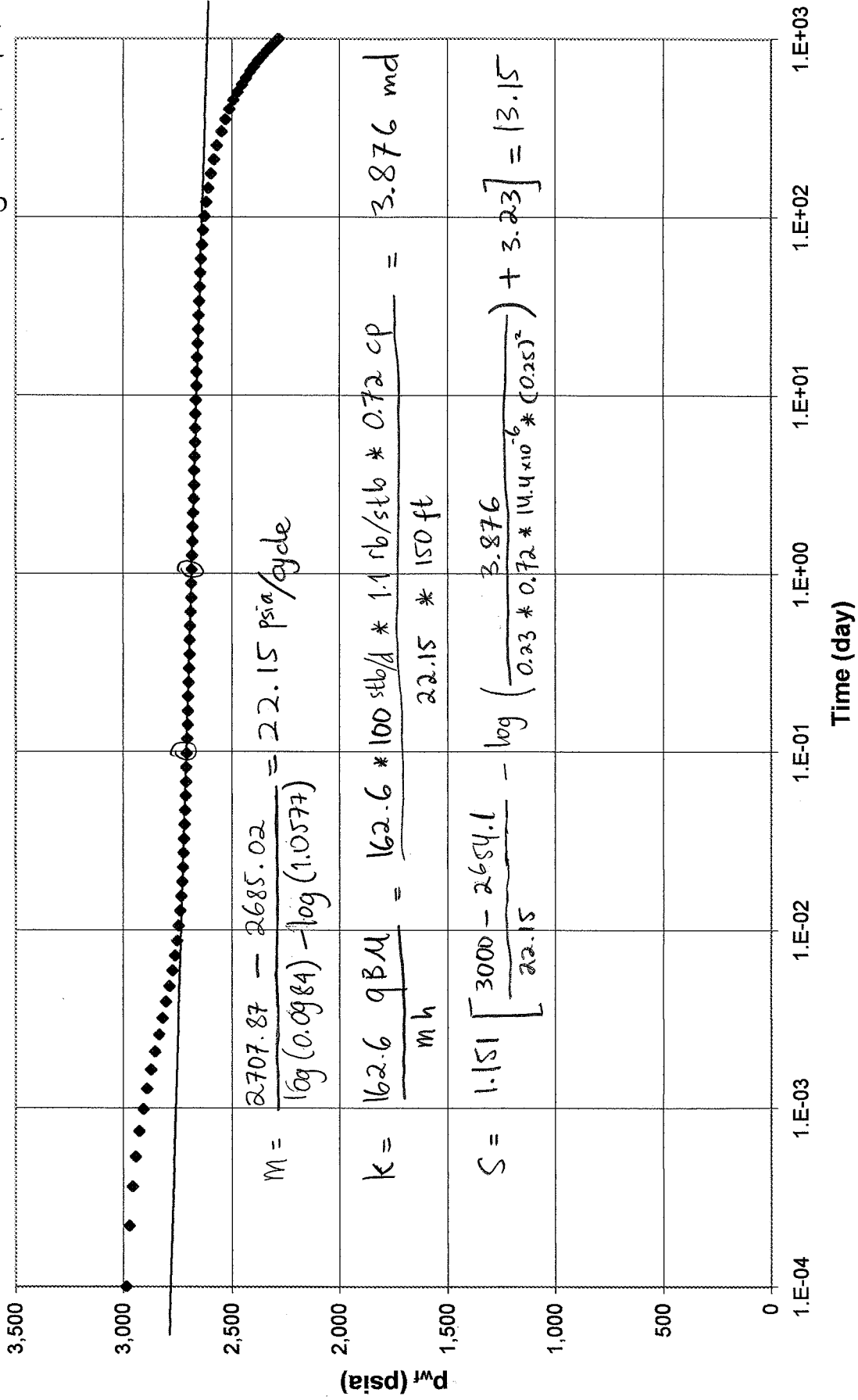


$$y - y_1 = m (\log x - \log x_1)$$

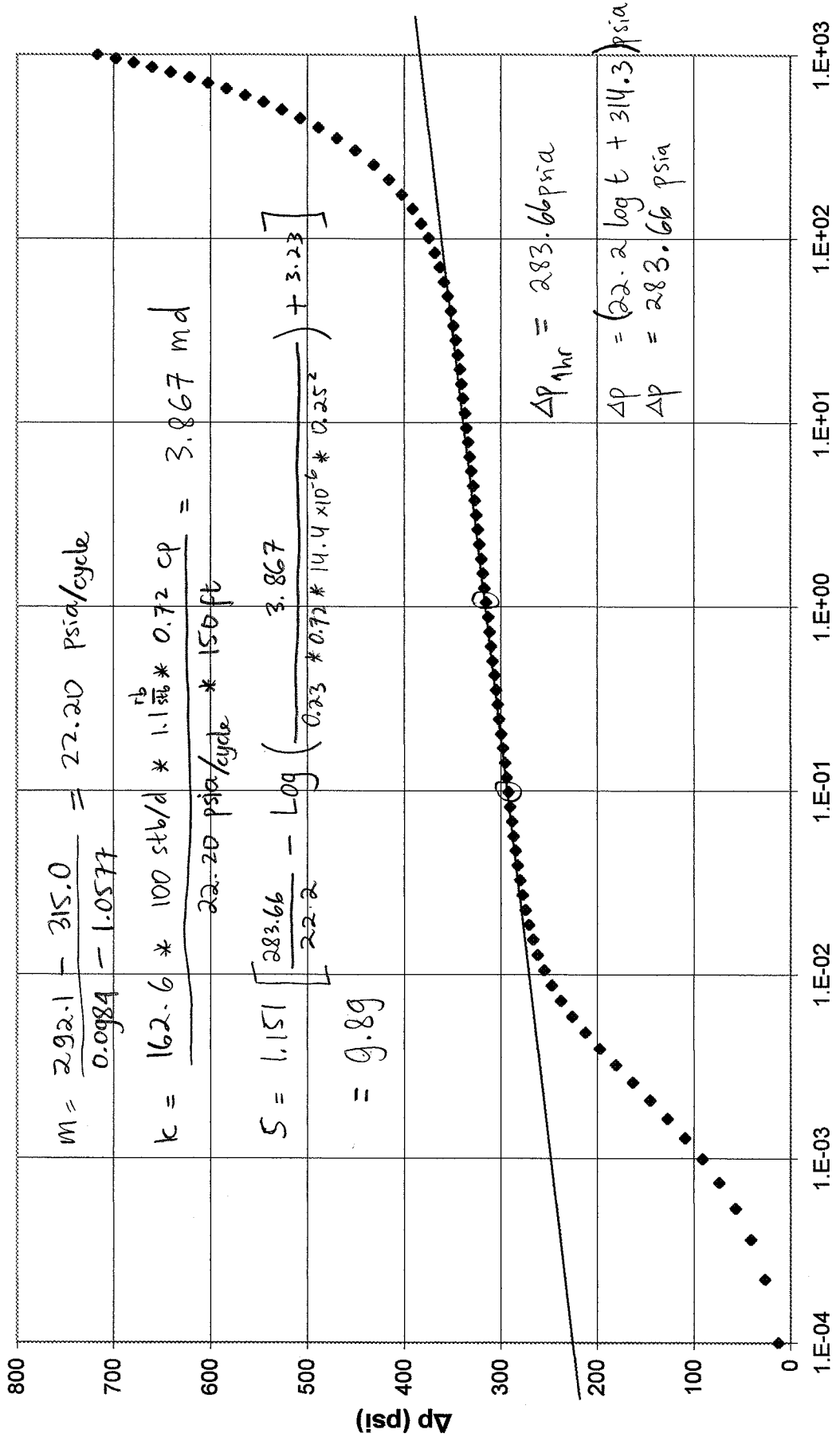
$$y - 2685.02 = 22.15 (\log x - \log 1.0577)$$

$$y = 22.15 \log x + 2684.48$$

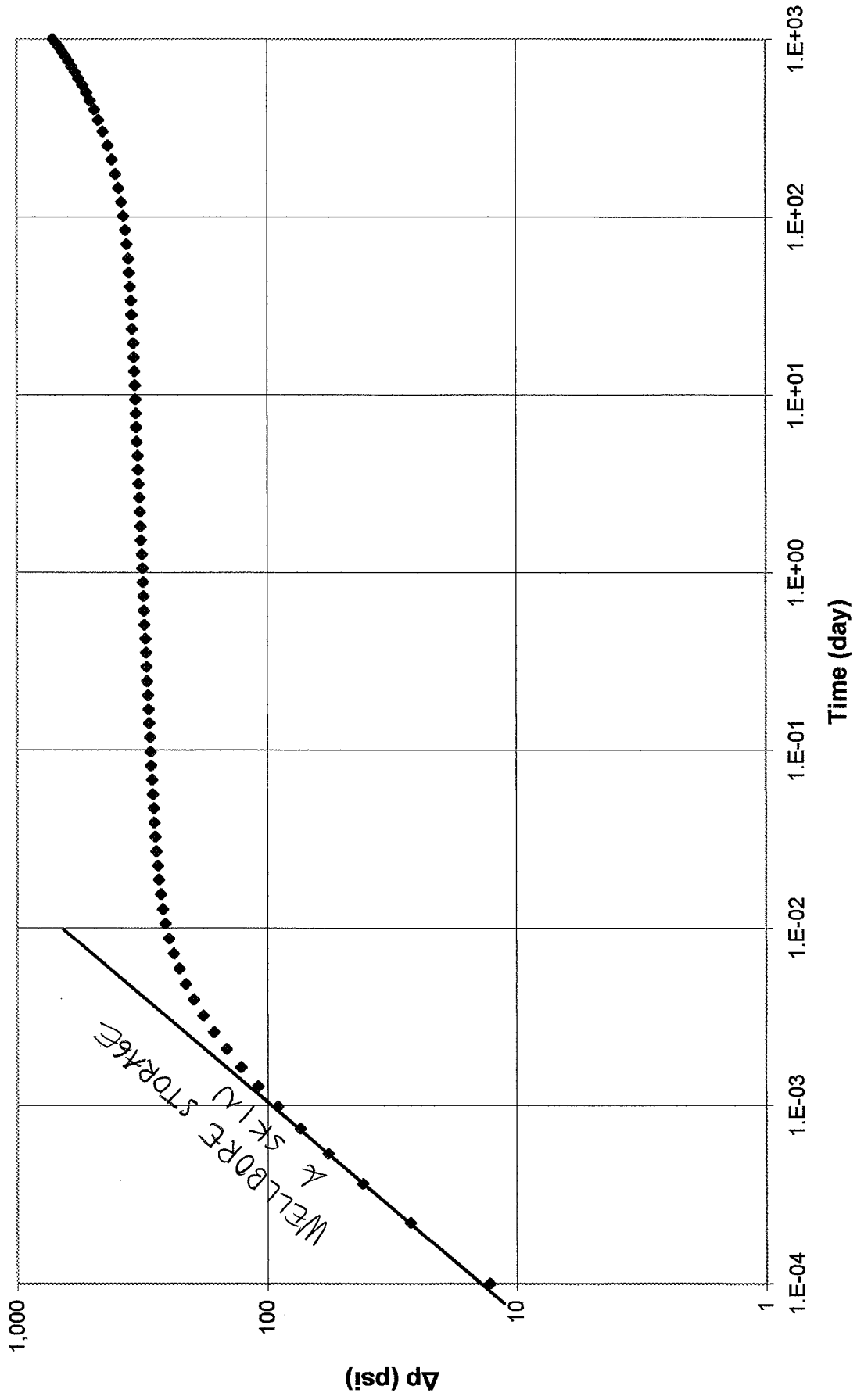
Semi-Log Plot ( $p_{wf}$  vs. Time)



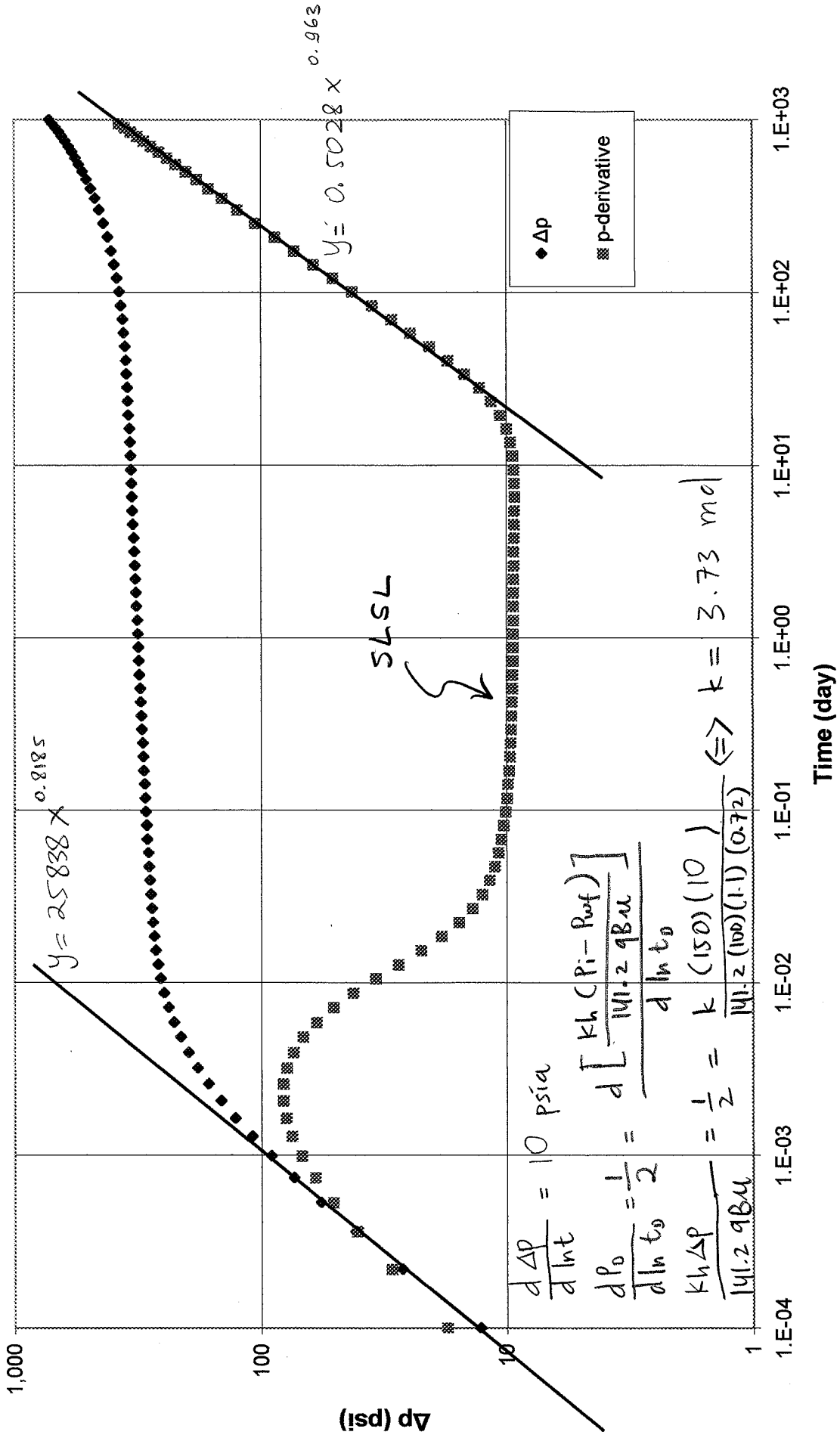
### Semi-Log Plot ( $\Delta p$ vs. Time)



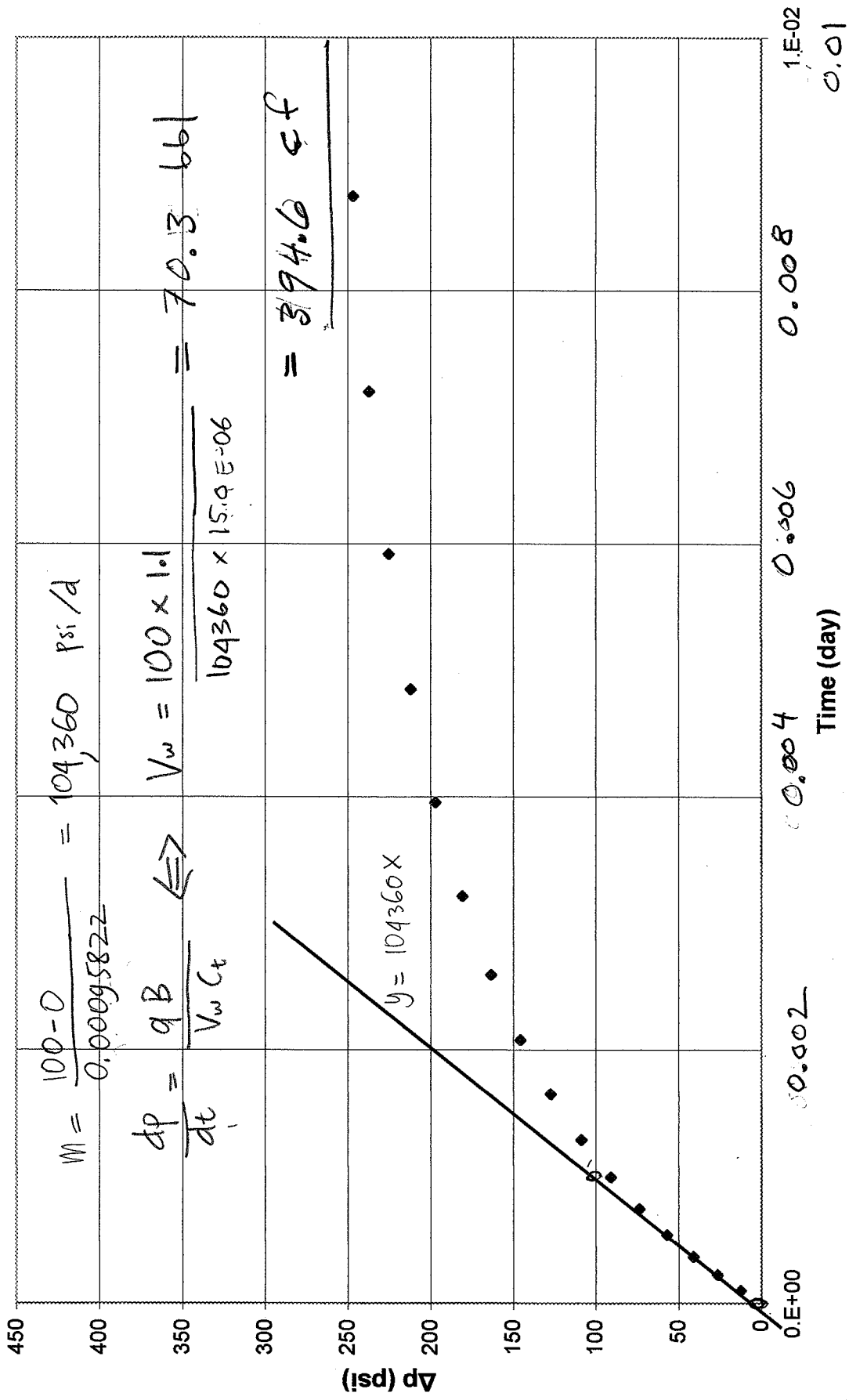
Log-log Plot ( $\Delta p$  vs. Time)



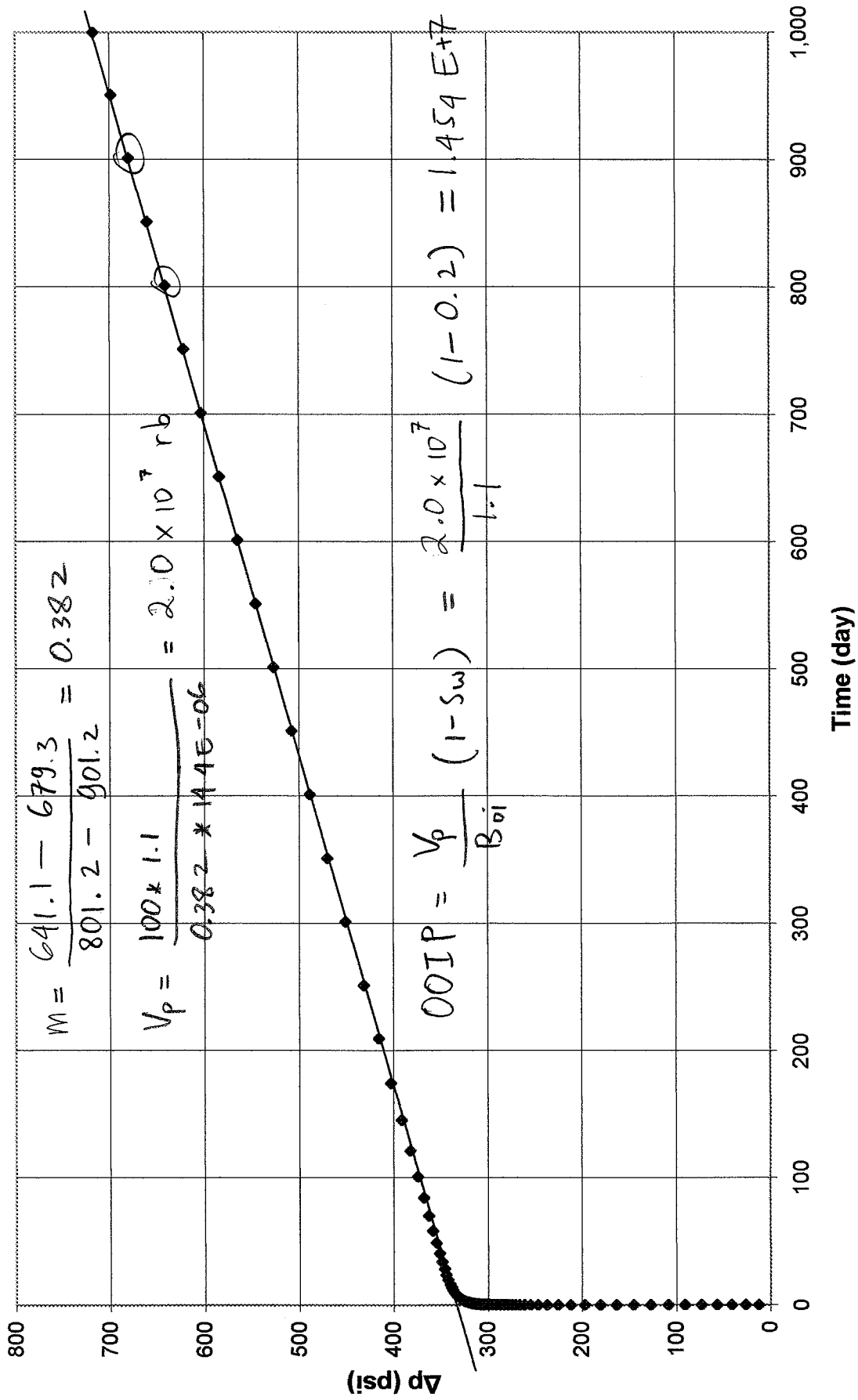
# Type Curve



### Early Cartesian ( $\Delta p$ vs. Time)



### Late Cartesian ( $\Delta p$ vs. Time)



Pressure Profile at 1,000 days

