Homework Assignment No. 7: due Wednesday 27 March 2002

Given:
In this assignment you are to provide a complete analysis of a pressure drawdown test sequence provided in the "Earlougher and Kersch Example."
You are to provide a complete analysis of these data—including Cartesian, Semilog, Log-log, and Type Curve analysis methods (as appropriate).

Required:
- Using the attached plots, you are to perform "type curve" analysis on these data and provide estimates of the following parameters:
  a. The formation permeability, \( k \).
  b. The dimensionless wellbore storage coefficient, \( C_D \).
  c. The near well skin factor, \( s \).
- You are also to verify/calculate properties using the specialized plots which are provided (pressure versus time, pressure versus logarithm of time, logarithm of pressure drop and pressure drop derivative versus logarithm of time).

Type Curve Analysis Relations: (for the "Bourdet -Gringarten" type curve):
The governing relations for the "Bourdet -Gringarten" type curve are:

Formation Permeability:
\[
    k = 141.2 \frac{qB\mu}{h} \frac{[p_{wD}]_{\text{MP}}}{[\Delta p]_{\text{MP}}}
\]

Dimensionless Wellbore Storage Coefficient:
\[
    C_D = 0.0002637 \frac{k}{\phi \mu C_D (r_w^2)} \frac{[\Delta t \text{ or } \Delta r]_{\text{MP}}}{[t/D/C_D]_{\text{MP}}}
\]

Skin Factor:
\[
    s = \frac{1}{2} \ln \frac{[C_D e^{2s}]_{\text{MP}}}{C_D}
\]

Note: The Bourdet-Gringarten type curve for radial flow behavior, including wellbore storage and skin effects, is attached in a 1 inch-by-1 inch format in this handout. For better resolution, you are encouraged to use the 3 inch-by-3 inch version of this type curve and the data curves (which are provided in a separate handout).
Petroleum Engineering 324 — Well Performance
Homework No. 7 — Complete Analysis of Pressure Drawdown Test Data
20 March 2002 — Due: Wednesday 27 March 2002

Earlougher and Kersch Example: (includes wellbore storage and skin effects)
These data are taken from Earlougher and Kersch. The data are for a pressure "drawdown" test sequence run on an oil (liquid) well. Wellbore storage and skin effects are included.

**Reservoir properties:**
- \( \phi = 0.18 \)
- \( r_w = 0.276 \text{ ft} \)
- \( c_l = 8.2 \times 10^{-6} \text{ psia}^{-1} \)
- \( h = 35 \text{ ft} \)

**Oil properties:**
- \( B_o = 1.2 \text{ RB/STB} \)
- \( \mu_o = 1.0 \text{ cp} \)

**Production parameters:**
- \( p_i = 2214 \text{ psia} \)
- \( q_o = 179 \text{ STB/D} \)

**Well Test Data Functions:**

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<th>Point</th>
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<th>( p_{wf}, \text{ psia} )</th>
<th>( \Delta p, \text{ psi} )</th>
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**References:**


**Required:**

Using the attached plots, you are to perform "type curve" analysis on these data and provide estimates of the following parameters:

a. The formation permeability, \( k \).
b. The dimensionless wellbore storage coefficient, \( C_D \).
c. The near well skin factor, \( s \).

You are to perform "conventional" Cartesian and semilog analysis on these data and provide estimates of parameters to compare (as appropriate) to the estimates obtained from "type curve" analysis.
Cartesian Plot: Early-Time Pressure Data (Earlougher and Kersch Example)
Semilog Plot: Early-Time Pressure Data (Earlougher and Kersch Example)
Log-Log Plot: Pressure Drop and Pressure Drop Derivative Data (1 inch x 1 inch) 
(Earlougher and Kersch Example)
Bourdet-Gringarten Type Curve: Dimensionless Pressure and Pressure Derivative Functions