

## Problem 2.79

[Difficulty: 3]

**2.79** According to Folsom [6], the capillary rise  $\Delta h$  (in.) of a water-air interface in a tube is correlated by the following empirical expression:

$$\Delta h = Ae^{-bD}$$

where  $D$  (in.) is the tube diameter,  $A = 0.400$ , and  $b = 4.37$ . You do an experiment to measure  $\Delta h$  versus  $D$  and obtain:

$D$ (in.)	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1
$\Delta h$ (in.)	0.232	0.183	0.09	0.059	0.052	0.033	0.017	0.01	0.006	0.004	0.003

What are the values of  $A$  and  $b$  that best fit this data using *Excel's Trendline* feature? Do they agree with Folsom's values? How good is the data?

**Given:** Capillary rise data

**Find:** Values of  $A$  and  $b$

**Solution:**

$D$ (in.)	$\Delta h$ (in.)
0.1	0.232
0.2	0.183
0.3	0.090
0.4	0.059
0.5	0.052
0.6	0.033
0.7	0.017
0.8	0.010
0.9	0.006
1.0	0.004
1.1	0.003

$$A = 0.403$$
$$b = 4.530$$

The fit is a good one ( $R^2 = 0.9919$ )

Capillary Rise vs. Tube Diameter

