Colebrook memo

$\varepsilon(m) = \text{"0.00003<}\varepsilon\text{>0.0001"}$
$D(m) = \text{"Pipe ID(m)"}$
$f = \text{"friction factor [dimensionless]"}$
$R = \text{"Reynolds [dimensionless]"}$
$[\varepsilon\ D] = \text{"in the same units system"}$
$f := 0.02 = \text{"initial guess all cases"}$

Moody Diagram from Colebrook

Colebrook formula

$$\frac{1}{\sqrt{f}} = -2.0 \cdot \log10\left(\frac{\varepsilon}{3.71 \cdot D} + \frac{2.51}{R \cdot \sqrt{f}}\right)$$

$t0 := time(1)$

$time = 1.2 \cdot min$

$$Find(f, R, D, \varepsilon) := solve\left(\frac{1}{\sqrt{f}} = -2.0 \cdot \log10\left(\frac{\varepsilon}{3.71 \cdot D} + \frac{2.51}{R \cdot \sqrt{f}}\right), f, 0, 1\right)$$

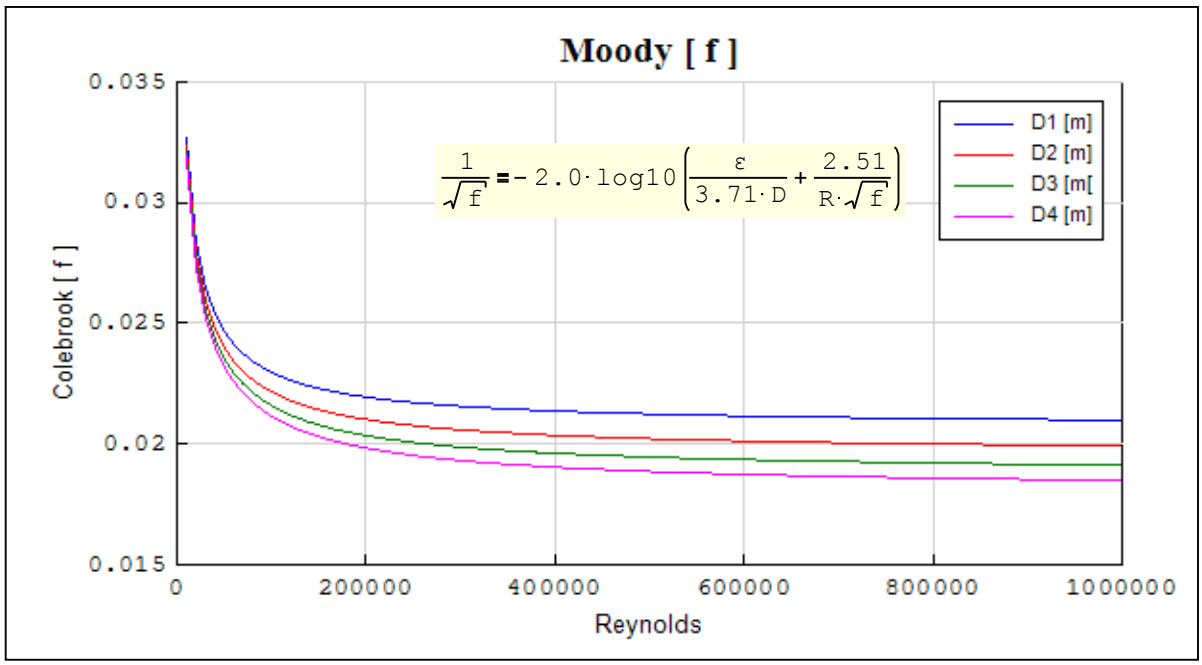
$Moody :=$ ""
$\varepsilon := 0.00005$
$R := 10000, 20000 .. 1000000$
$D := [0.04\ 0.05\ 0.06\ 0.07]^T$
for $i \in 1 .. rows(R)$
  for $j \in 1 .. rows(D)$
    $f_{i,j} := Find(f, R_i, D_j, \varepsilon)$
$[augment(R, col(f, 1))\ augment(R, col(f, 2))\ augment(R, col(f, 3))\ augment(R, col(f, 4))]$

Read this:
X_Y plot is for publishing, project collection.
It is terribly slow compared to Smath QuickPlot.
1. Smath => 5 min
2. X_Y => 27 min.
The other interpretation is that X_Y plot is NOT directly compatible to Smath construction.
Alternately: spool to file => 2.6 min.

$CWD := CurrentDirectory("C:\SmathFile")$

$wfile(Moody, CWD, "Moody") = 1$

$Moody := rfile(CWD, "Moody")$



$time(1) - t0 = 2.7\ min$

Next associated Engineering piping stuff:
"Inst_Colebrook Pipe Data"