1.

$R1 := 0.015$ $R2 := 0.02$

$Tyield := 3.534 \cdot 10^{-4}$

$L := 0.25$

$i := 0 .. 7$

$N_i :=$

2
5
10
20
50
100
200
500

$T_i :=$

0.011
0.021
0.034
0.056
0.106
0.172
0.279
0.53

$0.011 \cdot \left(\frac{R1}{R2}\right)^2 = 6.187 \times 10^{-3}$

$\Omega_i := \frac{2 \cdot \pi \cdot N_i}{60}$

$\Omega_3 = 2.094$

(i) $\tau yield := \frac{Tyield}{2 \cdot \pi \cdot L \cdot R1^2}$

$\tau yield = 1$ Pa

5 points

(ii) $\tau_i := \frac{T_i}{2 \cdot \pi \cdot L \cdot R1^2}$

$\tau_i =$ Pa

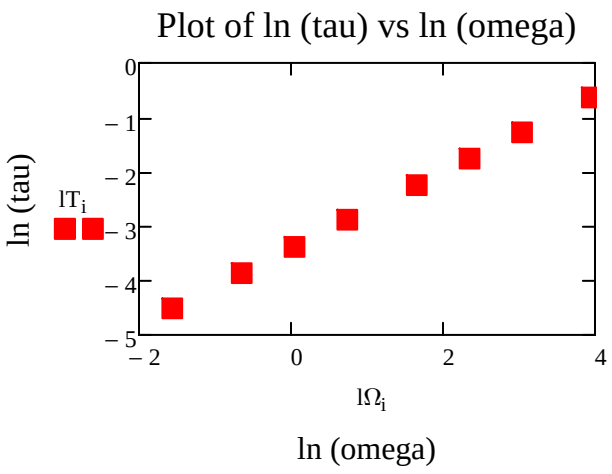
31.124
59.418
96.2
158.448
299.919
486.66
789.409
$1.5 \cdot 10^3$

5 points

(iii) $lT_i := \ln(T_i)$

$l\Omega_i := \ln(\Omega_i)$

5 points



$n := \text{slope}(l\Omega, lT)$

$n = 0.702$

(iii) $R0_i := \left(\frac{\tau_i}{\tau yield} \cdot R1^2\right)^{\frac{1}{2}}$

10 points

$i := 0..7$

$R2app_i := \begin{cases} R0_i & \text{if } R2 \geq R0_i \\ R2 & \text{otherwise} \end{cases}$

$R2app_i =$ m

0.02
0.02
0.02
0.02
0.02
0.02
0.02
0.02

$R0_i =$ m

0.084
0.116
0.147
0.189
0.26
0.331
0.421
0.581

$$\gamma_i := \frac{2 \cdot \pi \cdot \frac{\Omega_i}{60}}{n \cdot \left[1 - \left(\frac{R2app_i}{R1}\right)^{\frac{-2}{n}}\right]}$$

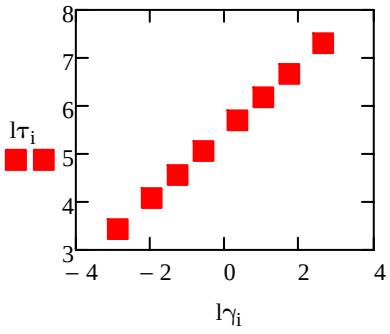
5 points

$\gamma_i =$ s^-1

0.056
0.14
0.279
0.559
1.396
2.793
5.586
13.964

(v) $l\tau_i := \ln(\tau_i)$

$l\gamma_i := \ln(\gamma_i)$



$n1 := \text{slope}(l\gamma, l\tau)$

$lK := \text{intercept}(l\gamma, l\tau)$

n1 = 0.702 lK = 5.466

K := exp(lK)

K = 236.489 Pa.s^n 5 points

2 R1 := $1 \cdot 10^{-2}$ m R2 := $1.05 \cdot 10^{-2}$ m L := $5 \cdot 10^{-2}$ m

i := 1 .. 5

speed$_i$:=

0.1
0.5
1
5
10

T_i :=

$6.55 \cdot 10^{-7}$
$1.72 \cdot 10^{-6}$
$2.61 \cdot 10^{-6}$
$6.85 \cdot 10^{-6}$
$1.04 \cdot 10^{-5}$

(i)

$$\tau 1_i := \frac{T_i}{2 \cdot \pi \cdot L \cdot R1^2}$$

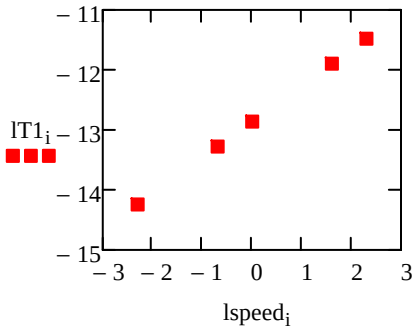
$\tau 1_i$ = Pa 5 points

0.021
0.055
0.083
0.218
0.331

(ii)

$lT1_i := \ln(T_i)$

$lspeed_i := \ln(speed_i)$



$n := slope(lspeed, lT1)$ 10 points

$n = 0.455$

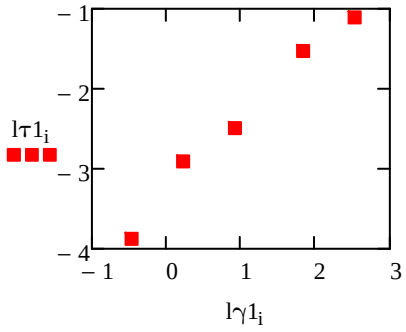
$$\gamma_i := \frac{2 \cdot \pi \cdot \frac{\Omega_i}{60}}{n \cdot \left[1 - \left(\frac{R2}{R1}\right)^{\frac{-2}{n}}\right]}$$

$\gamma_i =$ s^-1

0.624
1.249
2.497
6.243
12.486

(iii) $l\gamma 1_i := \ln(\gamma_i)$ $l\tau 1_i := \ln(\tau 1_i)$

5 points



n2 := slope(lγ1 , lτ1)

n2 = 0.494

lK2 := intercept(lγ1 , lτ1)

K2 := exp(lK2)

K2 = 0.091 Pa.s^n 5 points