Experiment 9: Hooke’s Law

Ben Giftakis

TA: Ryan Preusse

PS181 Section 3

5/5/20

DATA:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| g (m/s2) | mass, m(g) | mass, m (kg) | weight, W (N) | displacement, r (cm) | displacement, r (m) |
| 9.8035 | 60 | 0.06 | 0.58821 | 22 | 0.22 |
|  | 110 | 0.11 | 1.078385 | 30 | 0.3 |
|  | 160 | 0.16 | 1.56856 | 38.5 | 0.385 |
|  | 220 | 0.22 | 2.15677 | 48 | 0.48 |
|  | 260 | 0.26 | 2.54891 | 55 | 0.55 |
|  | 300 | 0.3 | 2.94105 | 61 | 0.61 |

Table 1: Measurements

|  |  |  |
| --- | --- | --- |
| weight, W (N) | displacement, r (m) | **N** |
| 0.58821 | 0.22 | 6 |
| 1.078385 | 0.3 | **slope** |
| 1.56856 | 0.385 | **N/m** |
| 2.15677 | 0.48 | 0.16674495 |
| 2.54891 | 0.55 | **intercept** |
| 2.94105 | 0.61 | **m** |
|  |  | 0.1217501 |
|  |  | **R2** |
|  |  | 0.9998005 |
|  |  | **Sy** |
|  |  |  |
|  |  | 0.00236474 |
|  |  | **Sslope** |
|  |  | **N/m** |
|  |  | 0.0011777 |
|  |  | **Sintercept** |
|  |  | **m** |
|  |  | 0.00234398 |

Table 2: 2d stats

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Unknown sets | | |  |
|  | r (cm) | r (m) | m (kg) | K(N/m) |
| 1 | 73 | 0.73 | 0.37209017 | 5.99718301 |
| 2 | 48.5 | 0.485 | 0.37209017 | 7.39945809 |

Table 3: Unknown Sets Calculated Values

CALCULATIONS:

(3)

(4)

RESULTS:

K1 was calculated to be 5.99718301 +- 0.042357475 N/m, the value of re was calculated to be 0.121750099 +- 0.002343975 m. The unknown mass was calculated to be 0.37209017 +- 0.04842 kg and the spring constant of the second spring was calculated to be 7.39945809 +- 1.36077. While I cannot do a precision accuracy test due to there being no given accepted value of the answers that I was given, I would say the experiment as I did it was reliable.

DISCUSSION:

I would say the experiment was quite reliable. All of the error was fairly small, and since the data was generated rather than rush measured by a TA the data seems to be quite reliable. Source of error for the initial sets of calculations are limited by the tools displayed in the dataset given to me, since it was generated data it is as precise as it can be. If the experiment were to be repeated, the best way to improve the data would be to use a more precise ruler.

QUESTIONS:

1. I chose not to remove any points from the data. After removing each point, I found that removing the first two points decreased R-squared, and the rest increased it very slightly. I felt this bump being so slight it was not worth removing any data.

2. re +- Sre = 0.1217501+-0.00234398 m

3. See calculation labeled (3)

4. See calculation labeled (4)