**Universidad de San Carlos de Guatemala**
**Facultad de ingeniería**
**Escuela de Ciencias**
**Área de Física**
**Laboratorio de Física Básica**

# PRACTICA # 3
# “Movimiento Rectilíneo Uniformemente Variado (MRUV)”

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**Carné:** 202100081
**Sección de laboratorio:** “B2”
**Fecha de realización:** 19/09/2022
**Instructor: Aux** JOSÉ ANDRÉS HERRERA
**Fecha de entrega:** 19/09/2022

# HOJA DE DATOS

| $x_1(m)$ | $t_1(s)$ | $t_2(s)$ | $t_3(s)$ | $t_4(s)$ | $t_5(s)$ | $t_6(s)$ | $t_7(s)$ | $t_8(s)$ | $t_9(s)$ | $t_{10}(s)$ |
|---|---|---|---|---|---|---|---|---|---|---|
| $0.100 \pm 0.001$ | 0.66 | 0.66 | 0.67 | 0.60 | 0.56 | 0.59 | 0.65 | 0.60 | 0.53 | 0.60 |
| $0.200 \pm 0.001$ | 0.88 | 1.00 | 0.92 | 1.07 | 1.14 | 1.38 | 0.87 | 1.12 | 1.08 | 1.06 |
| $0.300 \pm 0.001$ | 1.38 | 1.57 | 1.51 | 1.19 | 1.40 | 1.48 | 1.33 | 1.24 | 1.30 | 1.33 |
| $0.400 \pm 0.001$ | 1.46 | 1.66 | 1.66 | 1.52 | 1.65 | 1.58 | 1.52 | 1.52 | 1.59 | 1.91 |
| $0.500 \pm 0.001$ | 1.67 | 1.91 | 1.92 | 1.85 | 1.92 | 1.72 | 1.91 | 1.80 | 1.91 | 1.76 |
| $0.600 \pm 0.001$ | 2.00 | 2.04 | 2.05 | 2.03 | 2.11 | 2.18 | 2.39 | 1.98 | 1.97 | 1.98 |
| $0.700 \pm 0.001$ | 2.24 | 2.23 | 2.10 | 2.16 | 2.13 | 2.43 | 2.55 | 2.17 | 2.30 | 2.49 |
| $0.800 \pm 0.001$ | 2.48 | 2.46 | 2.57 | 2.38 | 2.57 | 2.45 | 2.57 | 2.56 | 2.43 | 2.44 |

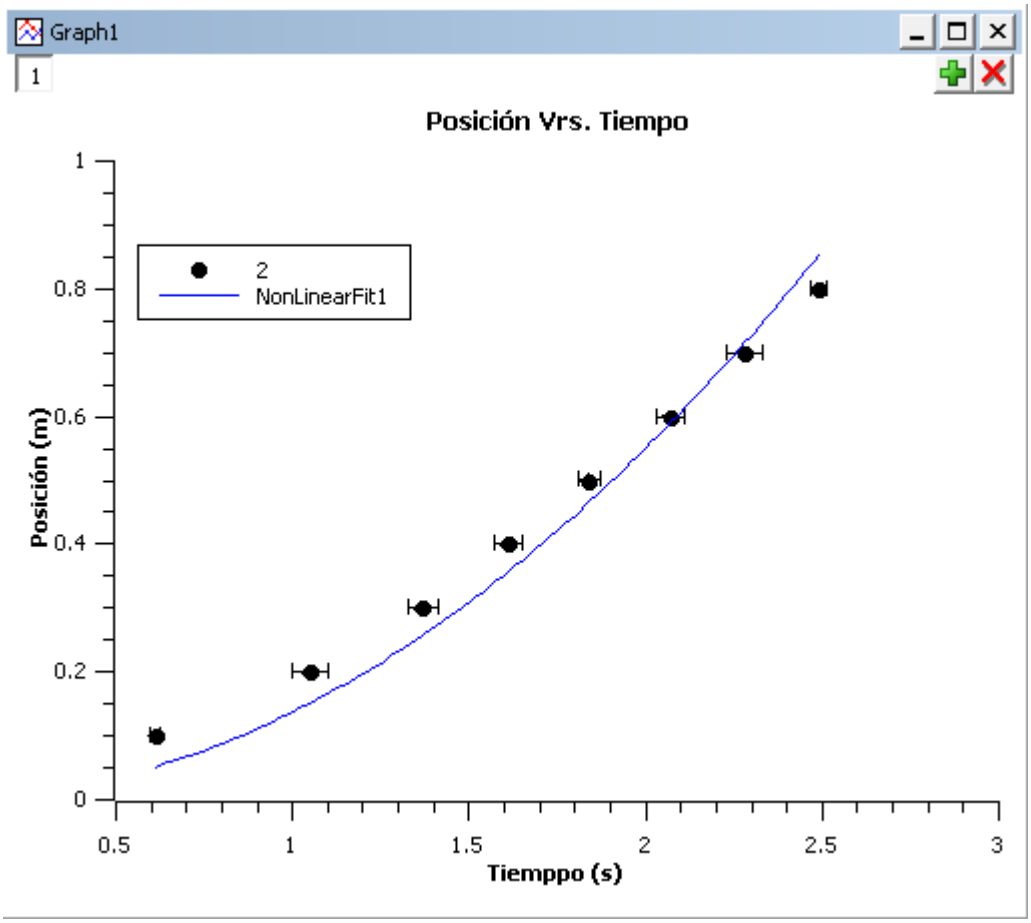
## Número de recorridos

| | PRIMERA | SEGUNDA | TERCERA | CUARTA | QUINTA | SEXTA | SEPTIMA | OCTAVA |
|---|---|---|---|---|---|---|---|---|
| | 0.66 | 0.88 | 1.38 | 1.46 | 1.67 | 2 | 2.24 | 2.48 |
| | 0.66 | 1 | 1.57 | 1.66 | 1.91 | 2.04 | 2.23 | 2.46 |
| | 0.67 | 0.92 | 1.51 | 1.66 | 1.92 | 2.05 | 2.1 | 2.57 |
| | 0.6 | 1.07 | 1.19 | 1.52 | 1.85 | 2.03 | 2.16 | 2.38 |
| | 0.56 | 1.14 | 1.4 | 1.65 | 1.92 | 2.11 | 2.13 | 2.57 |
| | 0.59 | 1.38 | 1.48 | 1.58 | 1.72 | 2.18 | 2.43 | 2.45 |
| | 0.65 | 0.87 | 1.33 | 1.52 | 1.91 | 2.39 | 2.55 | 2.57 |
| | 0.6 | 1.12 | 1.24 | 1.52 | 1.8 | 1.98 | 2.17 | 2.56 |
| | 0.53 | 1.08 | 1.3 | 1.59 | 1.91 | 1.97 | 2.3 | 2.43 |
| | 0.6 | 1.06 | 1.33 | 1.91 | 1.76 | 1.98 | 2.49 | 2.44 |
| **PR** | **0.612** | **1.052** | **1.373** | **1.607** | **1.837** | **2.073** | **2.28** | **2.491** |
| **D.E.** | **0.046856756** | **0.15053977** | **0.120189665** | **0.126758738** | **0.093577063** | **0.129103748** | **0.158254366** | **0.070624201** |
| **D.E.M.** | **0.014817407** | **0.047604855** | **0.038007309** | **0.040084633** | **0.029591665** | **0.04082619** | **0.050044425** | **0.022333333** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **M** | **0.612+/-0.015** | **1.05+/-0.05** | **1.37+/-0.04** | **1.61+/-0.04** | **1.84+/-0.03** | **2.07+/-0.04** | **2.27+/-0.05** | **2.49+/-0.02** |

| | MEDIDA | ERROR | MEDIDA | ERROR |
|---|---|---|---|---|
| **ACELERACIÓN** | **0.275** | **0.008** | **2.758** | **7.312** |

# Grafica Posición vs Tiempo




Results Log

[19/09/2022 Plot: "Graph1"]
Non-linear Fit of dataset: Table1_2, using function: 0.5*A*x^2
Weighting Method: No weighting
Scaled Levenberg-Marquardt algorithm with tolerance = 0.0001
From x = 6.120000000000000e-01 to x = 2.490000000000000e+00
A = 2.754473355196470e-01 +/- 8.217176880978967e-03

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Chi^2/doF = 1.804268477398828e-03
R^2 = 0.96992885871002
Adjusted R^2 = 0.964917001828356
RMSE (Root Mean Squared Error) = 0.0424766815723501
RSS (Residual Sum of Squares) = 0.0126298793417918

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Iterations = 2
Status = success

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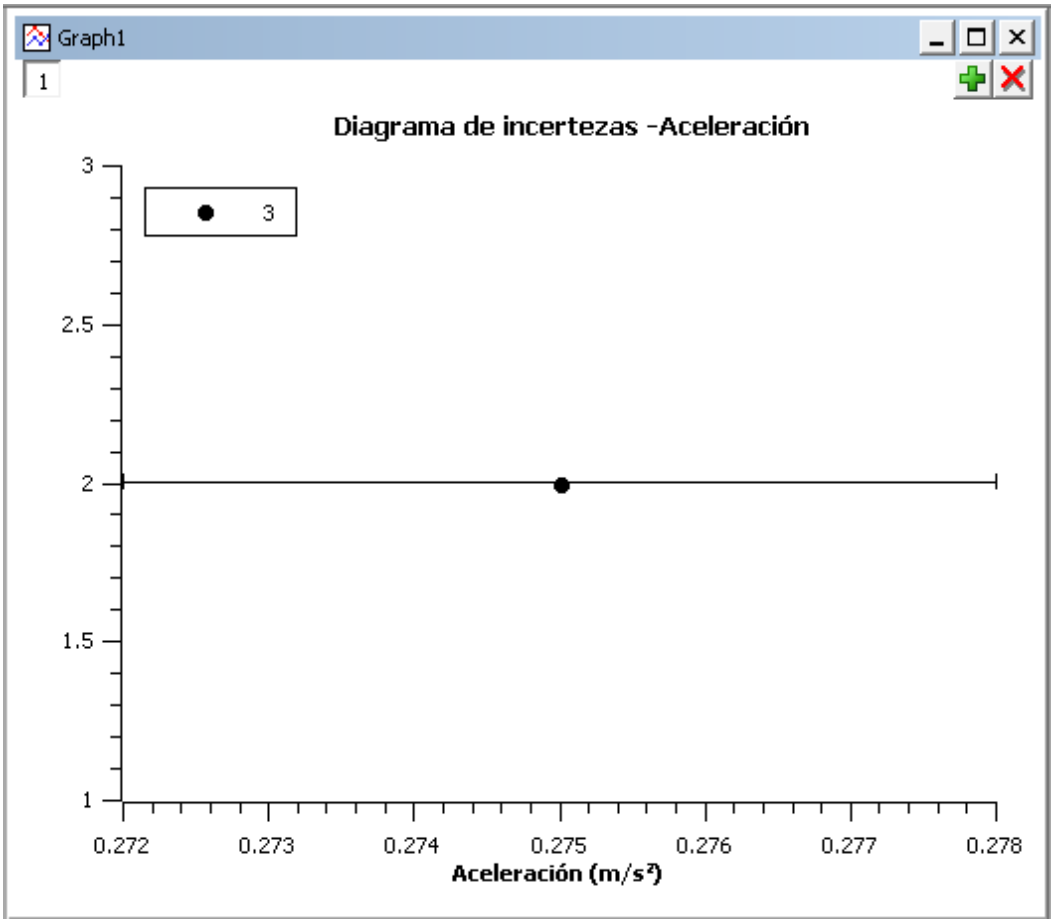
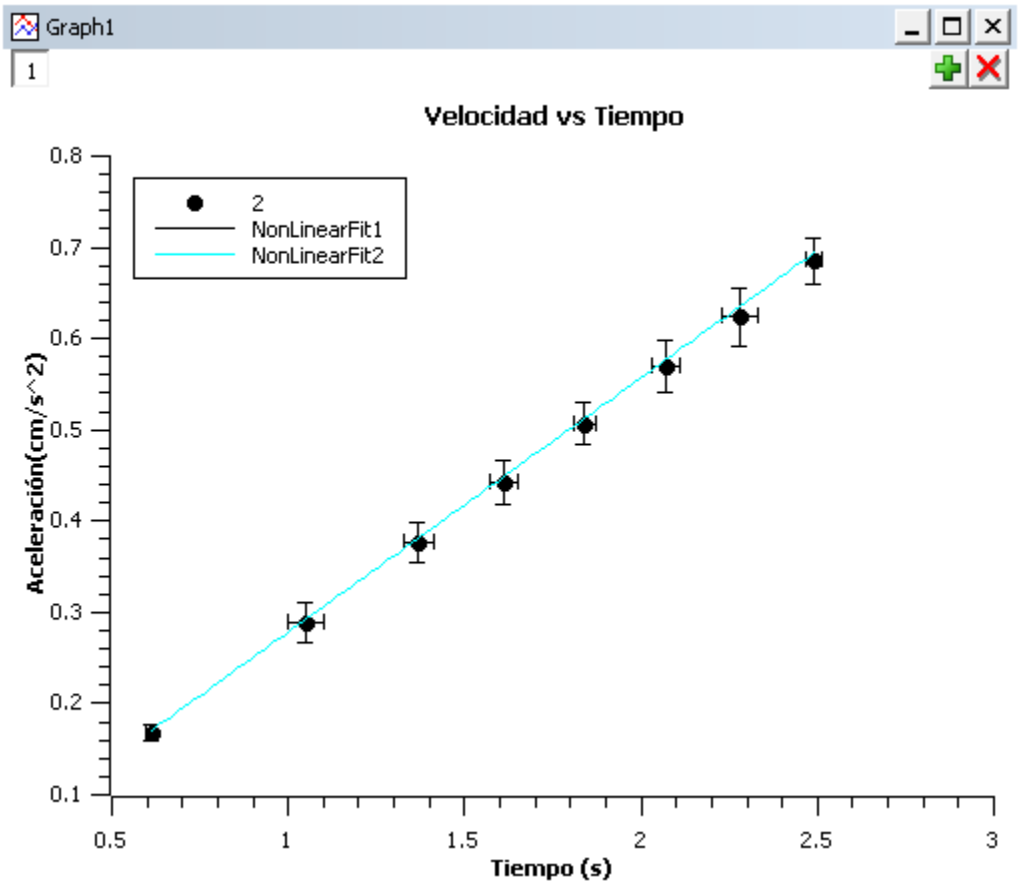
## Incerteza de la aceleración obtenida del grafico: Velocidad vs Tiempo



## VELOCIDAD VS TIEMPO




Results Log

19/09/2022 Plot: "Graph1"]
Non-linear Fit of dataset: Table1_2, using function: a*x
Weighting Method: No weighting
Scaled Levenberg-Marquardt algorithm with tolerance = 0.0001
From x = 6.1200000000000e-01 to x = 1.0500000000000e+00
a = 2.7576429679794e-01 +/- 7.3119013360162e-04

---

Chi^2/doF = 7.8968534451237e-07
R^2 = 0.9998938880214
RMSE (Root Mean Squared Error) = 0.0008886424165616
RSS (Residual Sum of Squares) = 7.896853445124e-07

---

Iterations = 2
Status = success

---

$$V = a * t \pm a * t(\frac{\Delta a}{t} + \frac{\Delta t}{a})$$

$$a = (0.275 \pm 0.008) m/s^2$$

$$V = (0.275) * (0.612) \pm (0.275) * (0.612) * (\frac{0.008}{0.275} + \frac{0.015}{0.612}) = (0.168 \pm 0.009)\text{m/s}$$

$$V = (0.275) * (1.05) \pm (0.275) * (1.05) * \left(\frac{0.008}{0.275} + \frac{0.05}{1.05}\right) = (0.289 \pm 0.022)\text{m/s}$$

$$V = (0.275) * (1.37) \pm (0.275) * (1.37) * \left(\frac{0.008}{0.275} + \frac{0.04}{1.37}\right) = (0.377 \pm 0.022)\text{m/s}$$

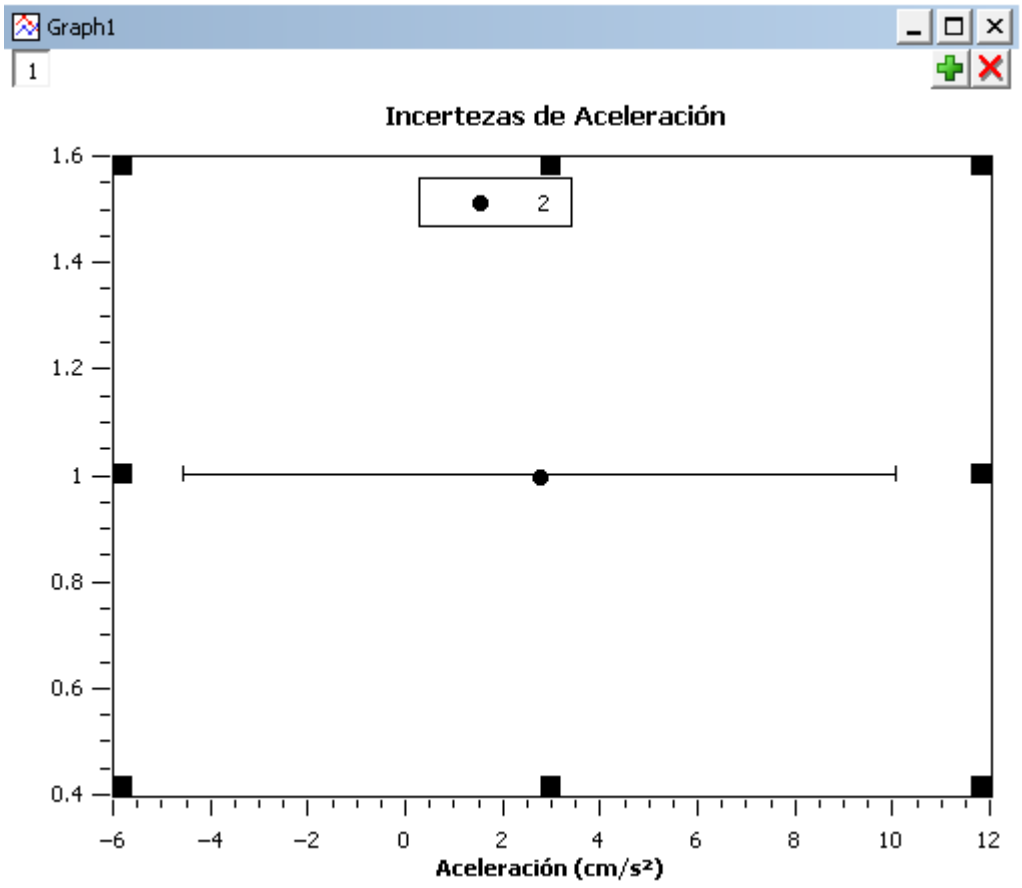
$$V = (0.275) * (1.61) \pm (0.275) * (1.61) * \left(\frac{0.008}{0.275} + \frac{0.04}{1.61}\right) = (0.443 \pm 0.024)\text{m/s}$$

$$V = (0.275) * (1.84) \pm (0.275) * (1.84) * \left(\frac{0.008}{0.275} + \frac{0.03}{1.84}\right) = (0.506 \pm 0.023)\text{m/s}$$

$$V = (0.275) * (2.07) \pm (0.275) * (2.07) * \left(\frac{0.008}{0.275} + \frac{0.04}{2.07}\right) = (0.569 \pm 0.028)\text{m/s}$$

$$V = (0.275) * (2.27) \pm (0.275) * (2.27) * \left(\frac{0.008}{0.275} + \frac{0.05}{2.27}\right) = (0.624 \pm 0.032)\text{m/s}$$

$$V = (0.275) * (2.49) \pm (0.275) * (2.49) * \left(\frac{0.008}{0.275} + \frac{0.02}{2.49}\right) = (0.685 \pm 0.025)\text{m/s}$$


Graph1
1
Incertezas de Aceleración
2
1.6
1.4
1.2
1
0.8
0.6
0.4
−6
−4
−2
0
2
4
6
8
10
12
Aceleración (cm/s²)