

Homework # 1

Walk the Graph

Turn a real movement into a function and explain its graph.

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Materials and working arrangements

- It should be in groups of **5 students**.
- Move a person or any small object along a straight line.
- Keep the final video within **3 minutes**.

Clear mathematics matters more than video production quality!

The recorded motion

Mark a straight number line and make its origin and units visible.

Record a movement lasting approximately 8-12 seconds. It must include:

- motion in the positive direction
- a period during which the person or object remains still
- motion in the negative direction
- at least one crossing of the origin
- at least one position visited at two different times.

The function and its graph

Define

$f(t)$ = the signed position at time t .

Construct the graph

- Record at least eight time-position pairs.
- Label both axes and include the units.
- Draw an approximate graph of $y = f(t)$.

Explain the graph

- State the practical domain and range.
- Find the zeros, maximum and minimum.
- Give the intervals where f increases, decreases or remains constant.

Functions, injectivity and inverse functions

In your explanation, answer all the following questions.

1. Why does the graph pass the vertical line test?
2. Is f injective? Identify two different times at which the object has the same position.
3. Find an interval on which f is injective.
4. On this interval, what does $f^{-1}(x)$ mean physically?

Submission checklist

Submit one video file or one accessible video link. Before submitting, check that your video includes:

- the original experiment and at least eight measurements
- a clearly labelled graph of f
- the domain, range and behaviour of f
- injectivity and the meaning of the restricted inverse
- the names of all students who participated.

The video should be sent to SHELDON.DANTAS@GMAIL.COM

The homework is ACCEPTED if

Component	Checked
Clear experiment and usable measurements	✓
Correct graph, domain and range	✓
Analysis of the graph and injectivity	✓
Physical interpretation	✓

Use mathematical language and explain every conclusion clearly!