helo

Chapter 1

Analisi

Introduzione

As an exercice demonstrate the following affermation with various methods:
Let $a, b \in \mathbb{N}$ odds $\implies a + b$ even.

Dimostrazione 1

We can write:

$$\begin{cases} a = 2n + 1 \\ b = 2k + 1 \end{cases} \quad \text{with } n, k \in \mathbb{N}$$

It follows directly that: $a + b = 2n + 2k + 1 + 1 = 2(n + k + 1)$ $\square$

Dimostrazione 2

Assume $a + b = 2k + 1$, writing $\begin{cases} a = 2n + 1 \\ b = 2m + 1 \end{cases}$ We arrive at the absurdity of $2k + 1 = 2(n + m + 1)$, which is obviously false. $\square$

Dimostrazione 3

By Induction. It will be left as an exercice to the reader. $\square$

The point here is to really say that there are better methods than others to do math.

1.1 Ensembles

Def: **Ensembles**

A set is an arrangement of objects (called elements).

Sets can be discret or continue. For exemple the set of all colors is coninue, whereas the set with elemnts "bleu", "rouge", "jaune" is discre.

We define the following operations between sets:

- $A \cup B = \{x; x \in A \wedge x \in B\}$
- $A \cap B = \{x; x \in A \vee x \in B\}$
- $A \backslash B = \{x; x \in A \wedge x \notin B\}$

1.2 Absolute Value

1.3 Limits

The series $(x_n)_{x \in \mathbb{N}}$ converges, if it is bounded , i.e.$\exists \sup x_n$ and is monotone, i.e. $x_{n+1} <> x_n$

Chapter 2

Meccanique

2.1 Reminders and Definitions

Objective is to understand how to describe and predict the motion of an object. Firts step is to describe the position of an object in time. Here its $\vec{r}(t)$ ad a function of time. Note how $\vec{r}$ is a vector.
The following step is to understand how the position of the object changes in time. We can define the mean velocity of an object as $\vec{v}_m = \dfrac{\vec{r}(t_2) - \vec{r}(t_1)}{t_2 - t_1}$. If we take time intervals progressivly smaller ($t_1 - t_2 = \Delta t \to 0$), we can write the previuos fraction as

$$\vec{v}(t) = \lim_{\Delta t \to 0} \frac{\vec{r}(t_1 + \Delta t) - \vec{r}(t_1)}{\Delta t}$$

which is the time derivative of the position, called $\dot{x}(t)$.
The following step is to aplly the same reasoning to the velocity, obtaining the acceleration $\ddot{r}(t)$. NOTE: these are still vectors.

Concept: the motion of an object depends on the point of view, of the *frame of reference.*
To keep a consistent view of physics, we need a model to concile the differente f.o.r., we call these *transoformatons*(think about Lorentz's or Galileo's).

Frame of refernce

Def: **Frame of reference (referentiel)**

A referentiel is composed of:

1. An origin, a firm point in your sistem to which distances are calulated.
2. One or more directions, that make possible to place object in space.
3. A scale, that can quantify these distances.

Galileo talked about referntiel inertiel:

Def: **referntiel inertiel**

Referentiel where free objects keep thir state of stillness or motion.
The rules of physics do not change between reference frames.

In particular, the math (meaning the laws of physics we arrive to) behind the motion does not change between f.o.rs.

Force

Def: **Force**

Is a an action that influnces an objec, different from itself.

The only way to change the state of stillness or linear motion of an object is to apply forces to it that sum to non-0. We arrive at the second law of Newton:

$$\sum \vec{F} = m\vec{a}$$

The third and last law is that for every action applied by A to B, there a force from B to A which is the vectorial inverse of the first.
Here goes the exemple of the chalk.