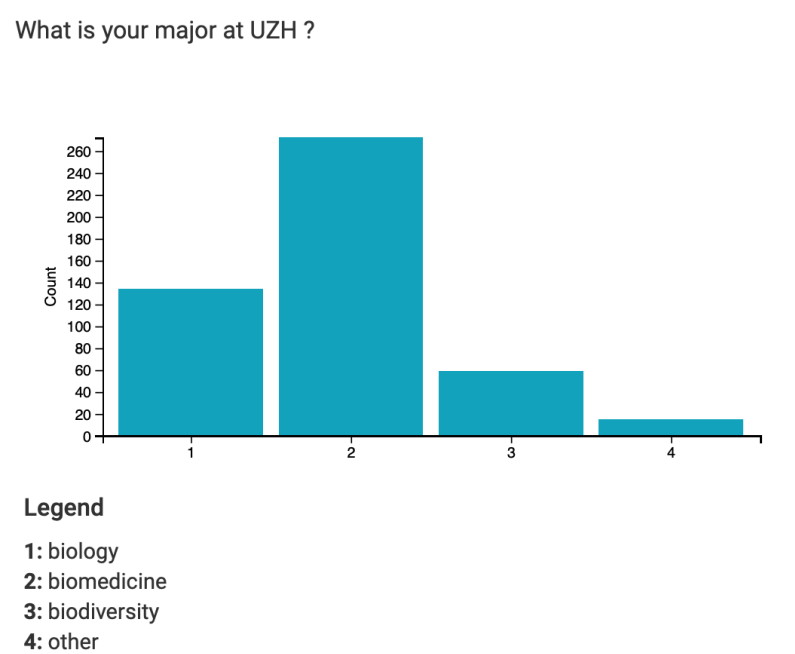
# PHY 117 HS2024

Today:

Circular motion
Integral = area
Forces
Newton's 3 Laws

Week 2, Lecture 1
Sept. 24, 2024
Prof. Ben Kilminster

# Survey 1: 482 participants




## Other majors:

Psychology (6)

Informatics/computer (4)

Educational sciences

Archaeology

Sociology

geography

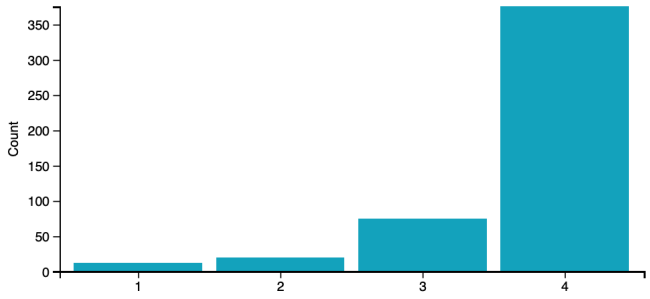
English Literature and Linguistics

## Minors

Astronomy and astrobiology iiiiiii
History, society, politics iiiiiii
Biomedicine iiiiii
Neuroinformatics iiiii
Earth systems iiii
Biodiversity iiii
Biology iii
Chemistry iii
Mathematics ii
Business ii
Banking & finance ii
Geography ii
Bioinformatics ii
Informatics / computing ii
Math i
Economics i
Media & communications i
Probability & statistics i

Cultural contexts
Sociology
Archaeology
Ethics
Anthropology
Political science
Ethnology
Biochemistry
Film studies
Environmental science
Philosophy
Psychology
English

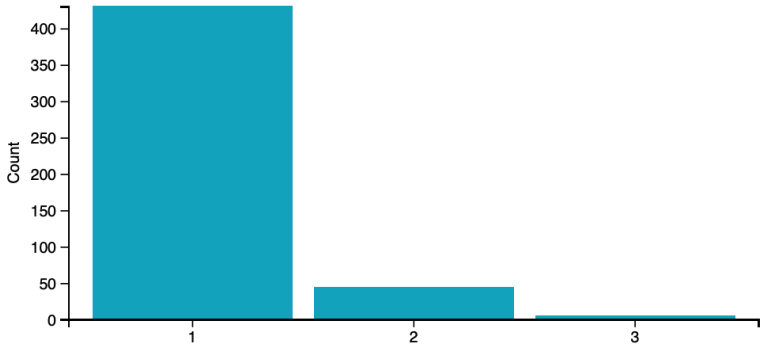
How many semesters of physics did you take in Gymnasium?




**Legend**

**1:** 0
**2:** 1
**3:** 2
**4:** more than 2

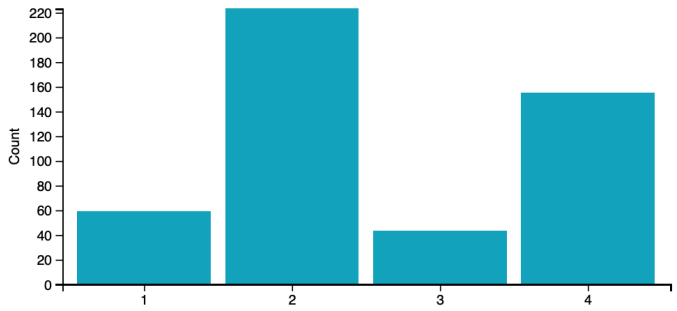
Are you taking MAT 182 ?




**Legend**

**1:** Yes
**2:** No
**3:** Not yet decided

Which statement fits you best ?




**Legend**

**1:** I enjoy physics and I do quite well in it.
**2:** I enjoy physics but I am not very good at it.
**3:** I don't enjoy physics, but I do quite well in it.
**4:** I don't enjoy physics, and I am not very good at it.

Is there something specific you want to learn in physics this semester ?

Physics related to biomedicine in order to understand the bigger picture and the physical forces in biology

How to pass the exams

deeper uncerstanding of electromagnetism

how to get good at physics

astrophysics topics if possible =)

Relation of physics with Chemistry

Nuclear physics, Radioactivity

Just how things work

Thermodynamics

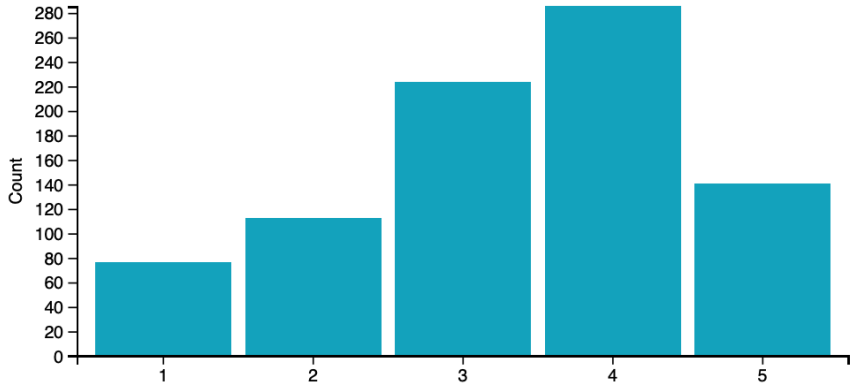
Everything 😭

personally, how to learn physics in an effective way to achive best results

Acceleration in various experiments
Electrical circuit

Quantum physics, Heisenberg uncertainty principle

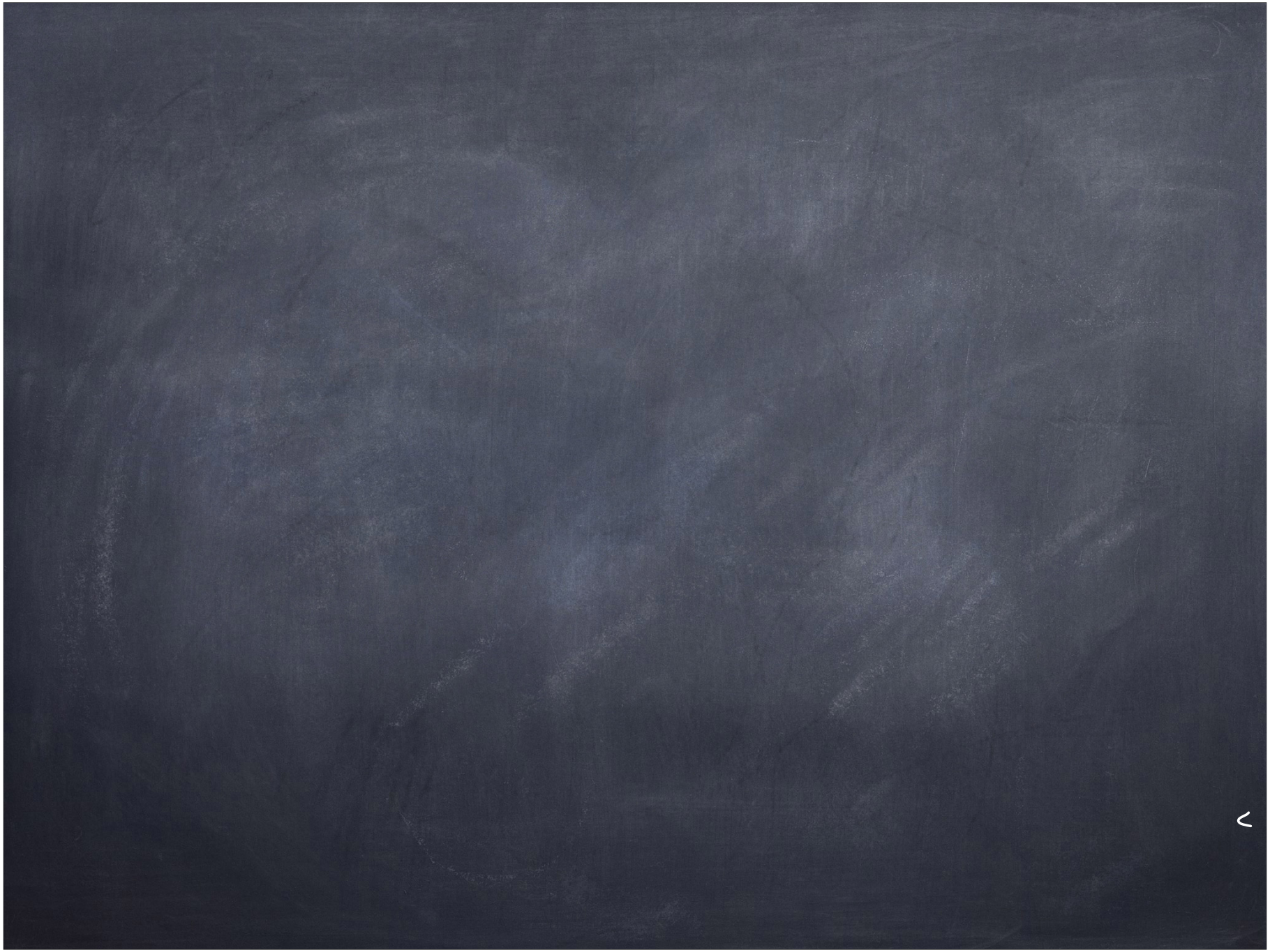
Check all of the following statements that are true

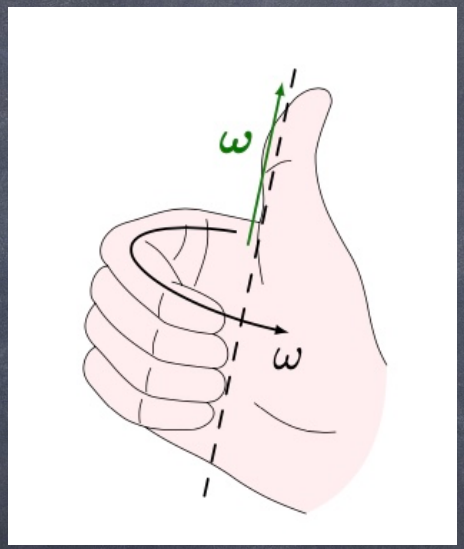


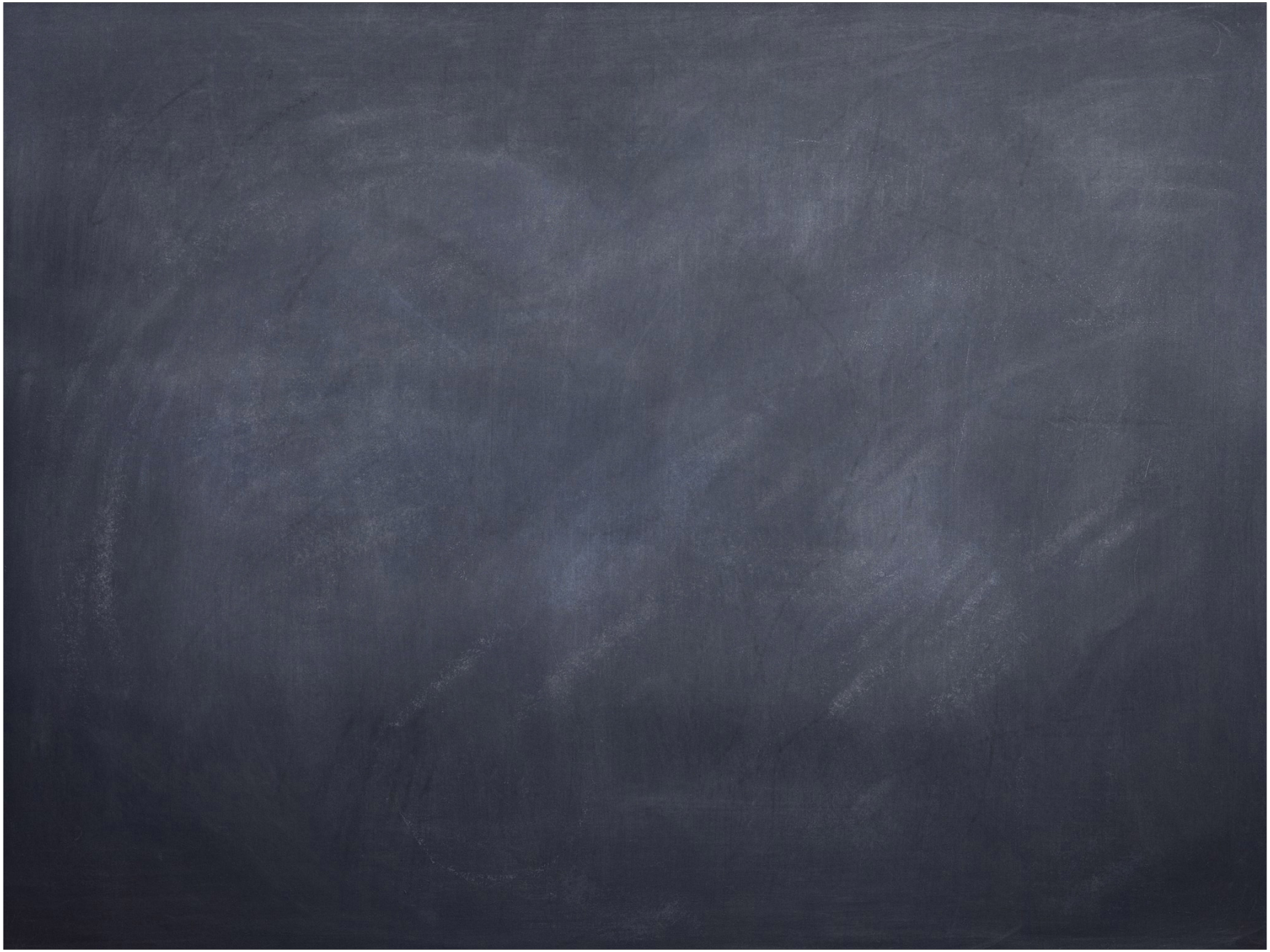

**Legend**

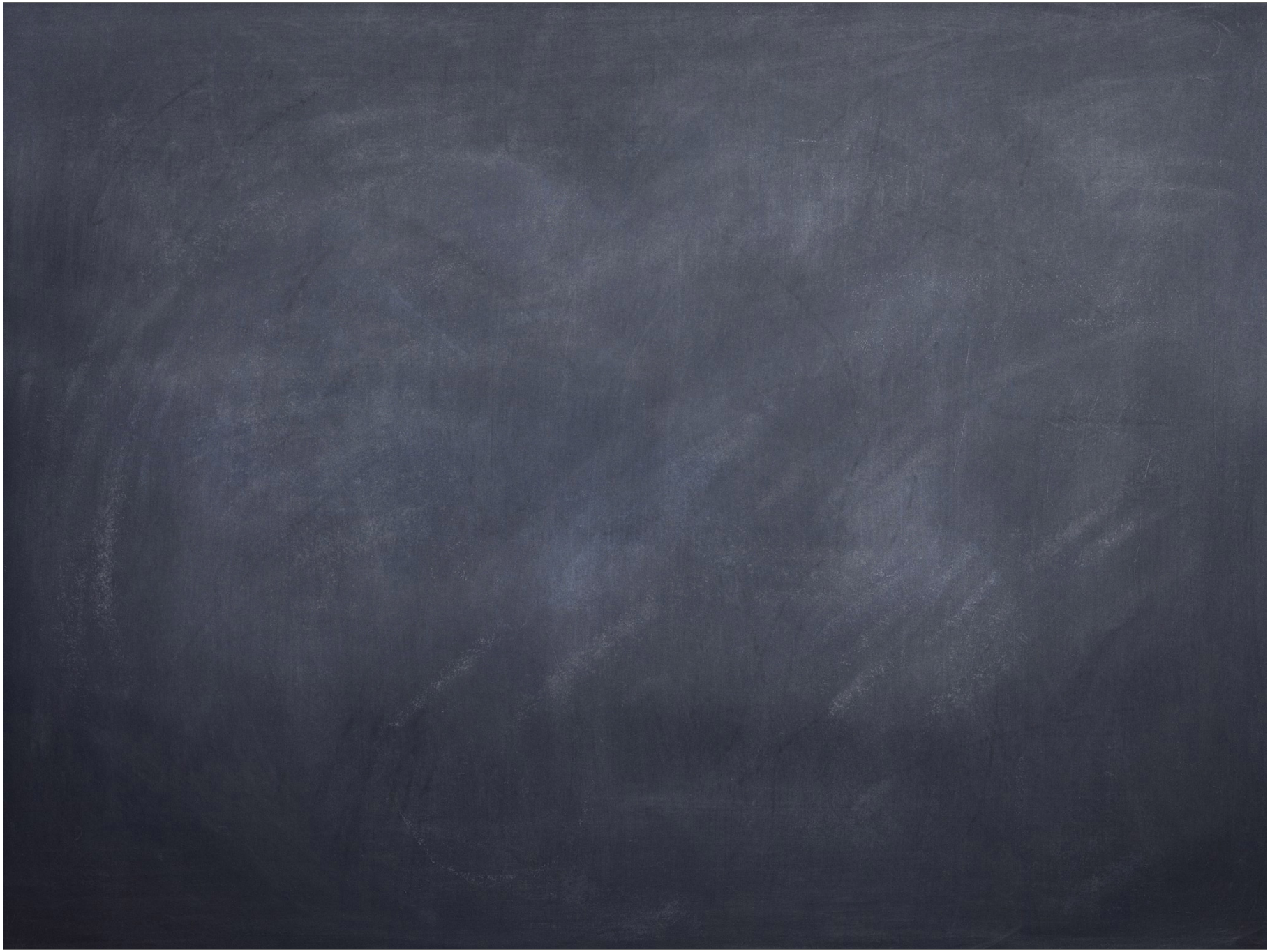
**1:** A unit vector has a magnitude of zero.
**2:** If a particle is moving at a constant velocity, the slope of distance vs. time will be zero.
**3:** The position of a simple harmonic oscillator repeats in a time of 2*pi/omega.
**4:** On the moon, a metal ball and a feather thrown from one astronaut to another would have the same parabolic motion.
**5:** The acceleration of an object moving in a circle points in the same direction as the velocity.

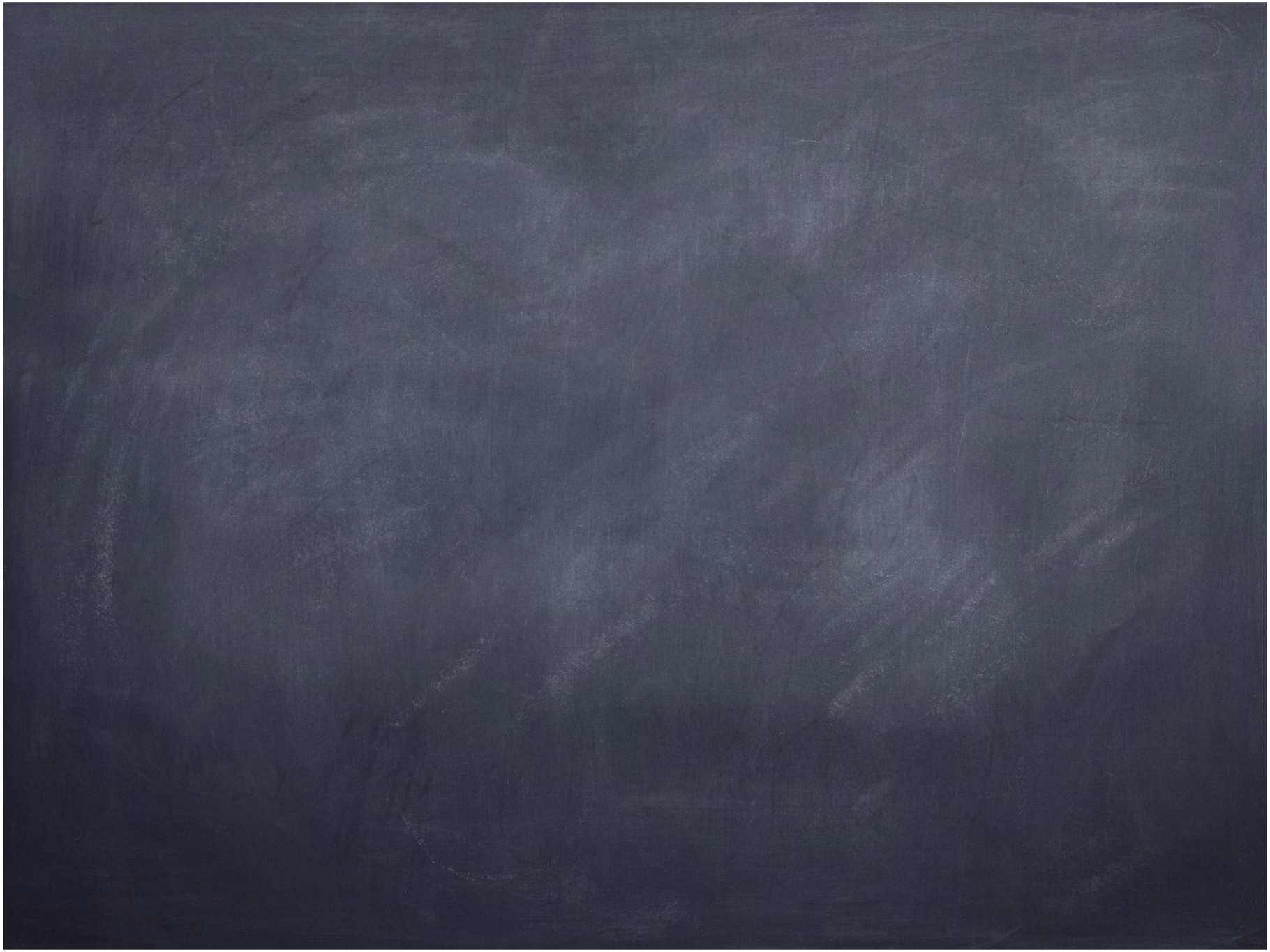
F
F
T
T
F

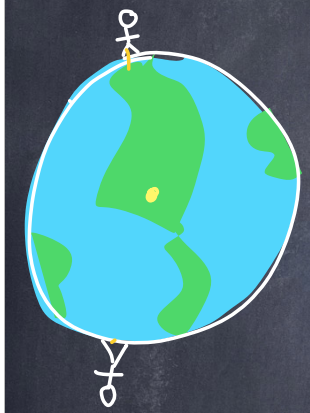


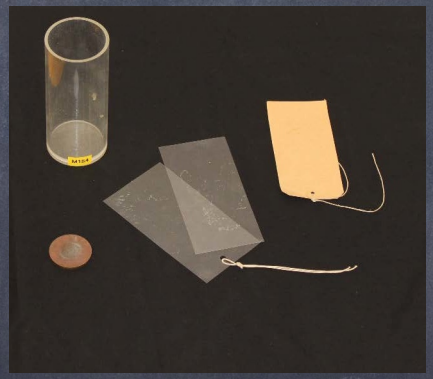

ω
ω

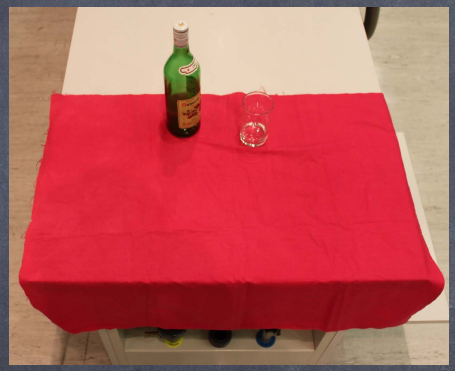


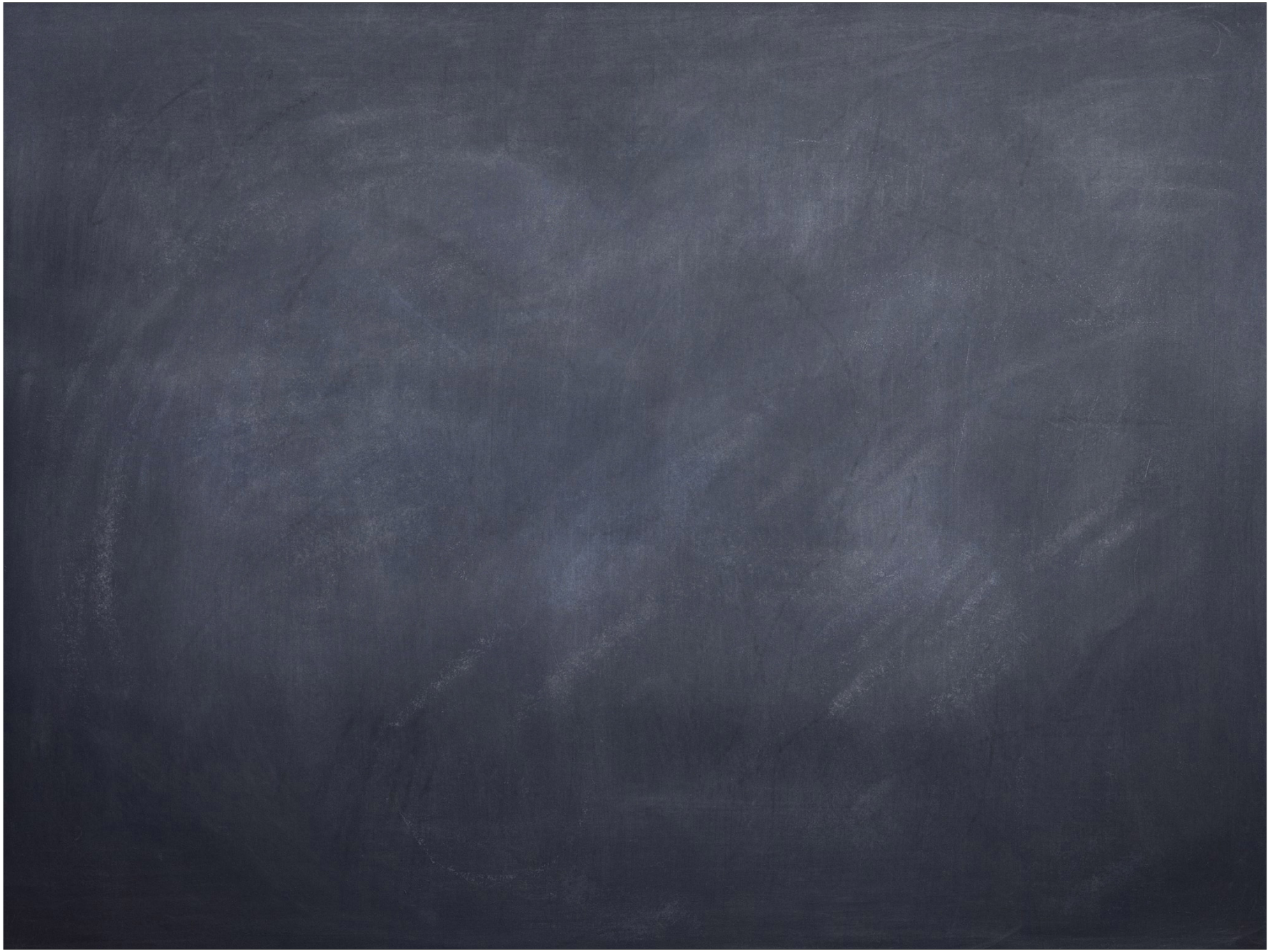


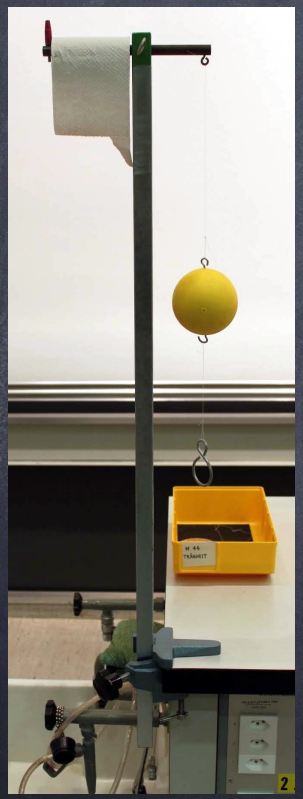


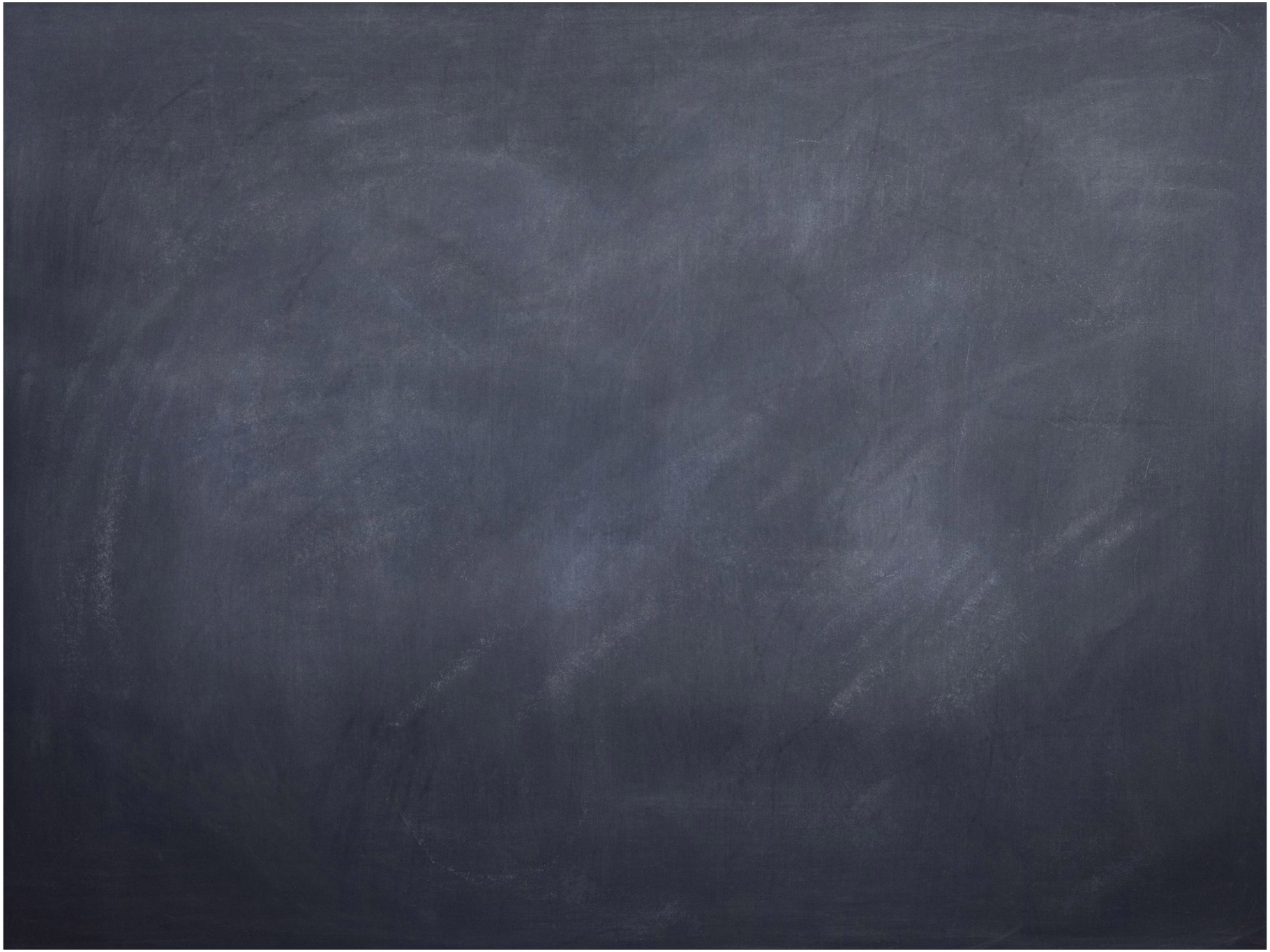


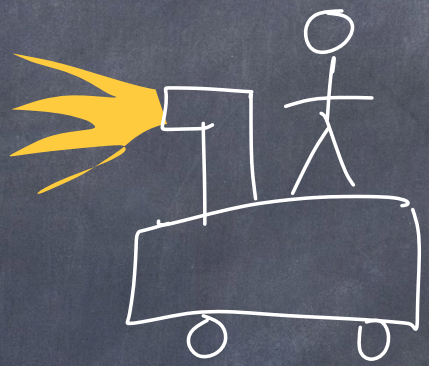


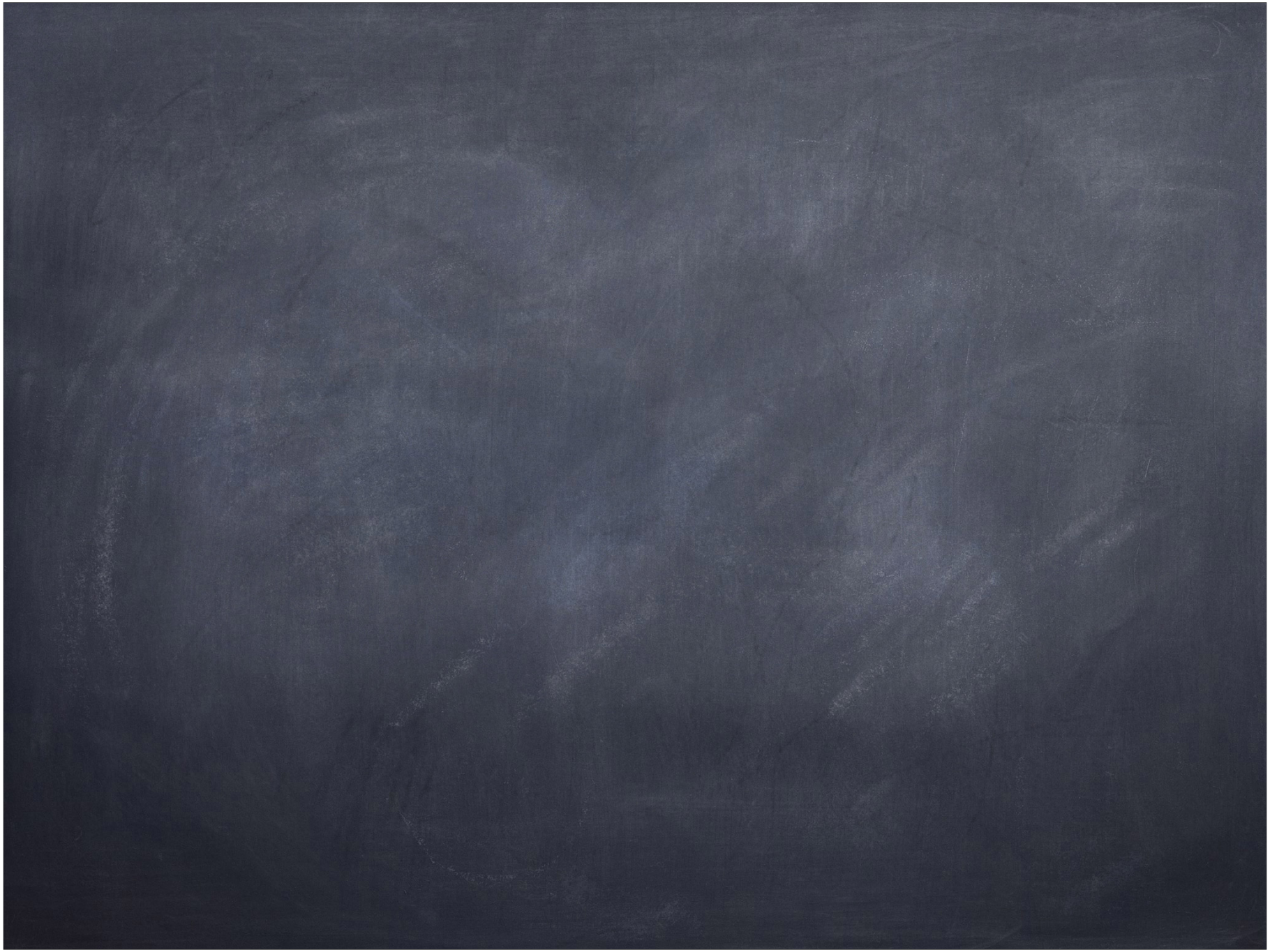


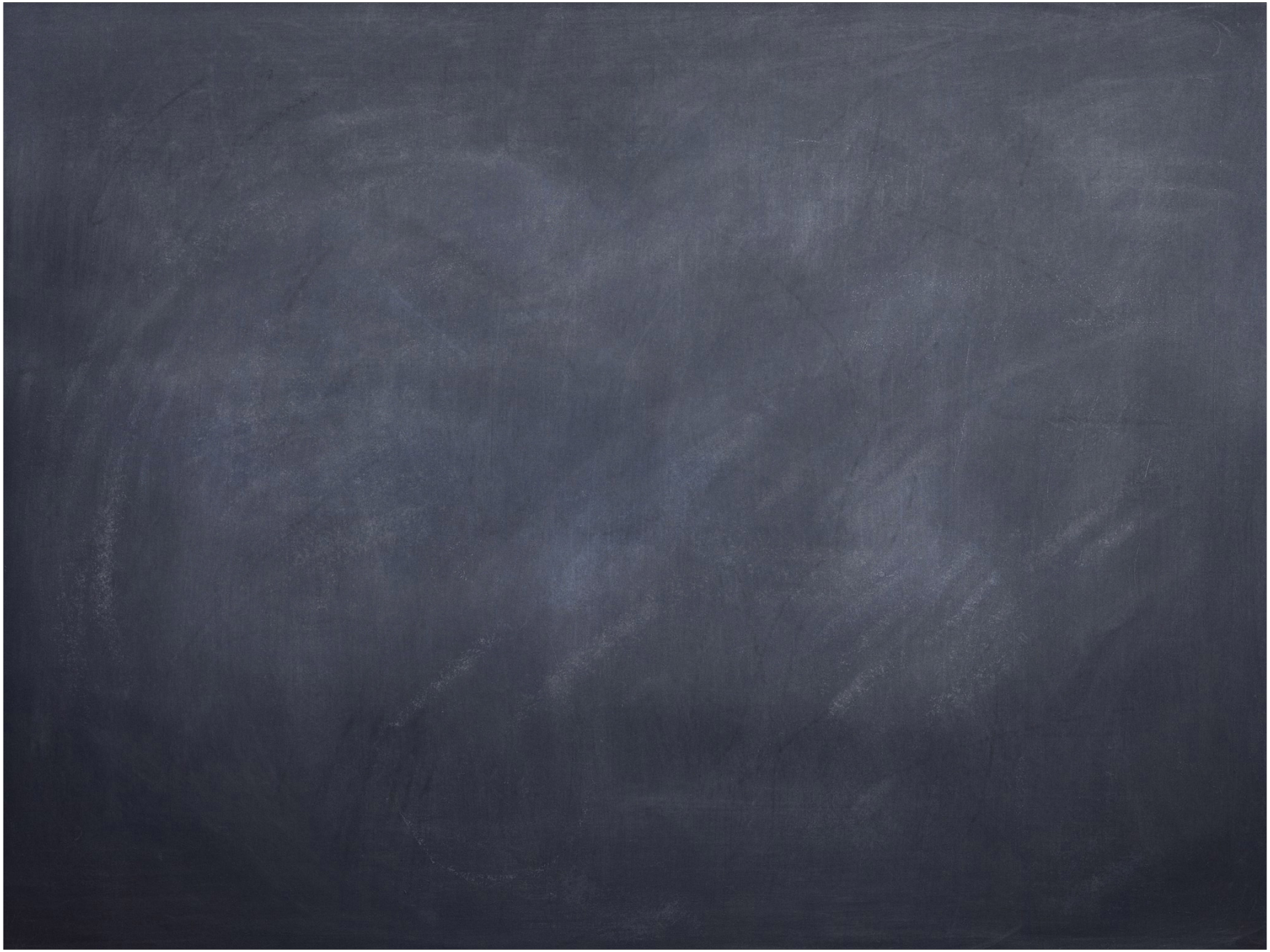


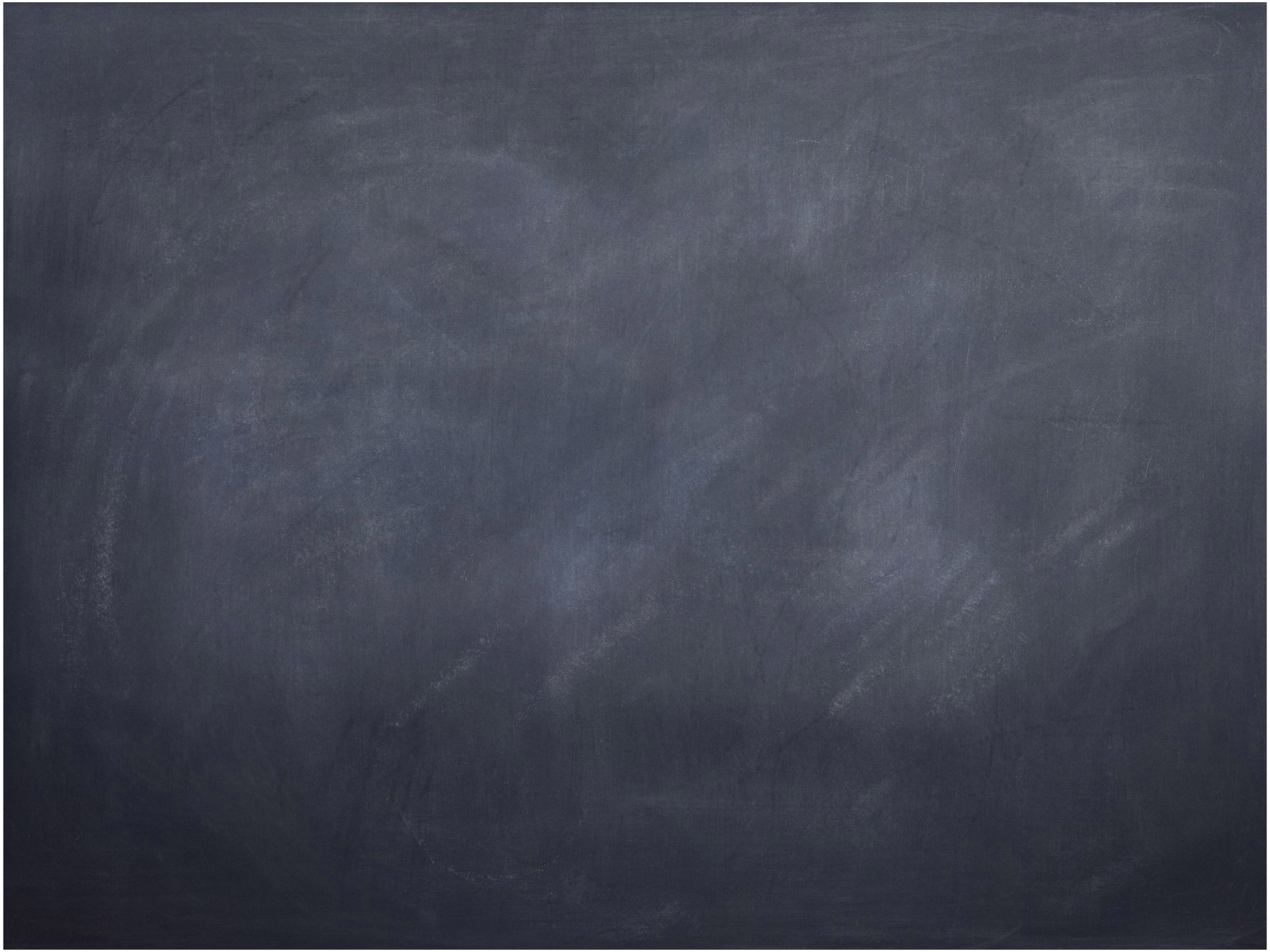




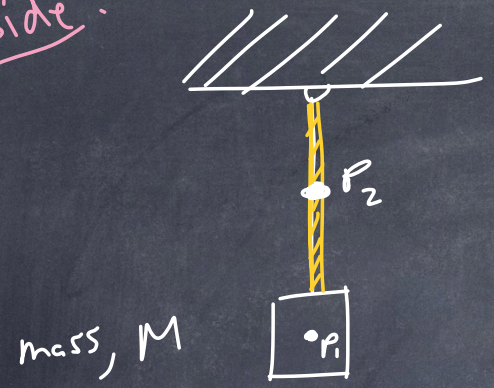








Aside:

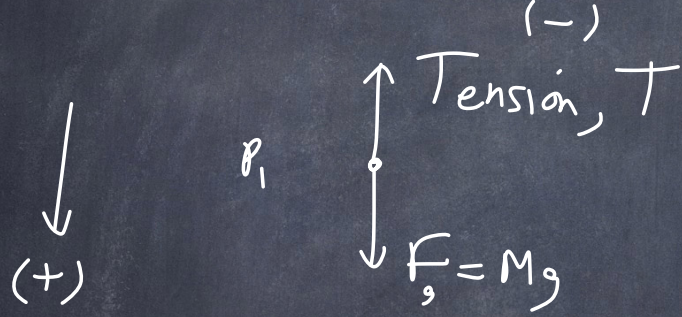



Exercise:

A mass M hangs from a string to the ceiling.

Draw the forces acting at $P_1$.

What about $P_2$?




If we use T and $F_g$ as scalars, then we need to keep track of negative signs.

(we state T is in (−) direction)

$$\Sigma F = F_g - T = 0 = ma$$

and $T = F_g$

But we must specify the direction

$F_g = Mg$ in (+) direction

$T = Mg$ in (−) direction

IF we use vectors for $\bar{F}_g$ and $\bar{T}$, then we don't need to explicitly put negative signs in our sum, $\Sigma F$.

$$\Sigma \bar{F} = \bar{F}_g + \bar{T} = 0$$

then $\bar{T} = -\bar{F}_g$

so $\bar{F}_g = M\bar{g}$

so $\bar{T} = -M\bar{g}$

In both cases $F_g$ points down & T points up.

Aside: Sometimes people write $\frac{df(x)}{dx}$ as $f'(x)$.
These two are the same.

Since $\frac{df(x)}{dx} = f'(x) \Rightarrow df(x) = f'(x)\,dx$

And if you take the integral of both sides:

$$\int df(x) = \int f'(x)\,dx$$

This becomes:

$$f(x) = \int f'(x)\,dx$$

which is the definition of an integral

Also, $\frac{d^2 f(x)}{dx^2} = f''(x)$