

SCENE ix

[Classroom in Space Center]

(VITO expresses attentiveness.)

(AIRMAN I, AIRMAN Ω , and AIRMAN Z are in a mental disarray.)

GIANG

Fallaci.

(GIANG brings in FALLACI with a mobile chalkboard.)

Thank you for bringing to light the problems that would arise from setting the course at dusk. We will promptly schedule this towards dawn.

(AIRMAN B tardily strolls in.)

AIRMEN

(AIRMEN groan.)

(FALLACI sits in a desk.)

GIANG

Ya'll have no minds to lose anyways. Doctor Ignatius Mạc should live rent free in your empty heads. I am here to open up your hearts to astrodynamics.

(GIANG draws a circle on the chalkboard.)

We all know the feeling of circular orbits.

(GIANG marks a point on the line of the circle and labels the point "m".)



This will be you, the object mass, going around the principal mass...

(GIANG marks a point in the middle of the circle and labels the point "M".)

Earth.

(GIANG draws a line from the edge of the circle to the center and labels the line, "r".)

Of course you want to get off the face of the Earth first before such a feat. The escape velocity—

VITO

(VITO interrupts.)

How far away would someone be if they fell off the edge of the world, let's say two decades ago?

(AIRMEN stare at VITO, bewildered.)

(FALLACI predicts the question would come up.)

GIANG

Already bombarding me with questions.

(GIANG pulls out an envelope. GIANG pulls out a paper.)

Mister Holliday.

(GIANG hides the envelope.)

Certainly will be that every day. Let's say, your Mother...

(GIANG draws a stick figure kicking another stick figure off the circle.)

...kicks you off your home planet because you asked a question that you should know the answer to. What is the initial height that you were asking for?

VITO

The edge.



GIANG

(GIANG hesitantly takes in the response.)

Where the atmosphere ends.

(GIANG lightly draws a line around the circle.)

Where space begins.

(GIANG draws a space suit on the stick figure outside the circle.)

Make sure you are dapper.

(GIANG peeks at VITO.)

(VITO appears engaged.)

(GIANG accidentally draws a bowtie on the stick figure outside of the circle.)

(GIANG clears her throat.)

(GIANG fiercely engulfs the space suit in chalk.)

And pressurized.

(GIANG pauses. GIANG peeks at VITO.)

May you repeat that stupid question?

VITO

Where am I now after over twenty years?

GIANG

(GIANG feels relieved.)

You at least have escaped my gravitational attraction. When you are seated...

(GIANG peeks at VITO.)

In your space suit veering off, your mechanical energy is conserved. As the force of gravity is conservative... What is your mass?



(VITO feels puzzled.)

AIRMEN

(AIRMEN chuckle.)

GIANG

(GIANG frantically writes on the chalkboard.)

Energy in general...

(GIANG writes " $E =$ ".)

...is your mass...

(GIANG writes " $\frac{1}{2}mv_e^2$ " after " $E =$ ".)

Your velocity to get yourself out of my sight. Your potential...

(GIANG writes " $\frac{mM_{\delta}g}{r_{\delta}}$ " widely after

" $E = \frac{1}{2}mv_e^2$ ".)

Your potential is always negative, Mister Holliday.

(GIANG places a minus sign between " $E = \frac{1}{2}mv_e^2$ "

and " $\frac{mM_{\delta}g}{r_{\delta}}$ ".)

Remember that.

(VITO feels discouraged.)

No matter where you course through, here and beyond into the unknown, as you are...

(GIANG points at the line labelled "r".)



Your energy is the same.

(VITO brightens.)

VITO

That would be all. Doctor Ignatius Mạc.

GIANG

Please, call me Giang.

FALLACI

Giang. The prob—

GIANG

(GIANG interrupts.)

No. Only Vito.

FALLACI

I understand that. But we raised him to treat teachers with manners, and respect. It is my duty to let you know that Vito has an issue.

GIANG

Is it medical?

(GIANG addresses VITO.)

The agency can find a suitable custodial role for you if that is the case.

FALLACI

No. He is not that well-rounded.



GIANG

I am getting these hints here. Vito Holliday, are you a Flat Earther?

AIRMEN

(AIRMEN burst out laughing.)

VITO

Fallaci?

FALLACI

I did not say anything.

VITO

I let you in on a little secret and you embarrass me in front of my friends?

AIRMAN Z

She was just setting you straight.

AIRMAN I

Yeah. Like the Earth.

AIRMEN

(AIRMEN return to laughing.)

GIANG

You have flown around the globe?

VITO

Globe?



GIANG

This is bad.

FALLACI

He is sharp as a fly above a disk of vegetable soup.

GIANG

Not getting that hint.

FALLACI

He is the world's greatest pilot.

GIANG

Has he ever taken an introductory astronomy course?

FALLACI

He was top of his class in the finest aviation academy for flight training.

GIANG

(GIANG rolls her eyes.)

This agency cannot vet these candidates with a proper background check... How was he in college?

VITO

I did not attend college.

GIANG

What?



FALLACI

He served.

GIANG

(GIANG feels nostalgic.)

Well like many undecided colleagues who did not rush out to wars, we fell in love with stars... And now here I am.

FALLACI

(FALLACI is motherly for VITO's sake.)

Tell me more about yourself. I would like to know your history.

AIRMEN

(AIRMEN groan.)

[The fire alarm echoes.]

VITO

Well that answers it.

(AIRMEN rush out. AIRMEN carry tables and chairs in.)

GIANG

(GIANG grabs ahold of VITO. GIANG hands the assignment to VITO.)

[A page of the assignment contains texts that are handwritten or printed from a typewriter:

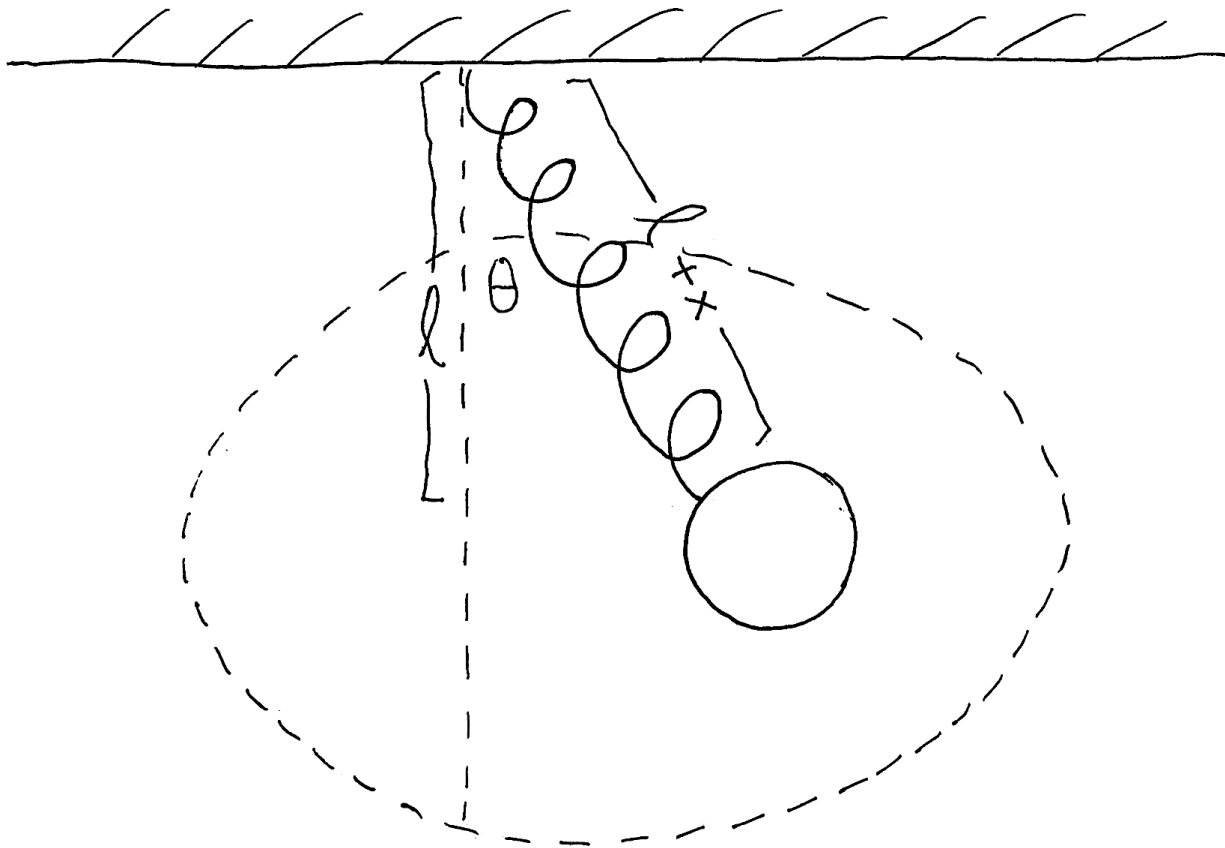
"Find the homogenous solution of the equation:

$$\ddot{x} + \dot{x} - 2x = 4e^{2it}$$



A mass is dropped from a height above the equator. Find the deflection, the position where the mass lands relative to being directly below the dropping point, due to the Coriolis force. Answer in terms of h , g and the angular velocity of Earth's rotation ω .

The opposite page has a diagram drawn out like:



The paper evidently has a low carbon footprint for its time.]

Meet me in my office located in the planetarium.

(GIANG pushes off the mobile chalkboard.)

[The fire alarm ceases.]



SCENE x

[Mess Hall in Space Center]

(VITO and FALLACI sit together.)

(AIRMEN sit around.)

(CHEFs enter and exit to hand food to VITO, FALLACI, and AIRMEN.)

FALLACI

Giang seems kind of cute.

VITO

(VITO feels unnerved.)

Acute.

FALLACI

Why so obtuse?

VITO

I passed the physical with flying colours.

(VITO focuses on the assignment in hand.)

Physics will not let this fly.

(VITO reads the assignment.)

Find the homogenous solution of the equation... Second derivative X plus single time derivative minus two X which equals negative four I sine of two T.

(VITO contemplates.)



The solution is $A \text{ times } E \text{ to negative two } T \text{ plus } B \text{ times } E \text{ to the } T$.

FALLACI

Straightforward.

(VITO motions his hand like a wave.)

VITO

The oscillation is a sinusoidal pattern though.

FALLACI

Prove me wrong again and you will flatline.

(VITO flattens his hand.)

VITO

(VITO reads the assignment.)

A mass is dropped from a height above the equator...

(VITO stares blankly at the assignment.)

FALLACI

(FALLACI expresses nostalgia.)

The world's waist reminds me of my first experience skydiving. I swore to Anu when I landed and greeted the natives of Ugan...

(FALLACI recalls that VITO sees the world as flat.)

You got to realize that the beltline is not laying on a flat surface, but wraps around a body.

(VITO continues to read the assignment.)

Find the deflection...

(FALLACI feels insulted.)



The position where the mass lands relative to being directly below the dropping point, due to the Coriolis force...

FALLACI

You cannot spin this in your favour. You will have to take into account that if the Earth is flat, she cannot rotate.

(VITO stares at FALLACI. VITO flips the assignment around. VITO flips the assignment around again.)

FALLACI

You poor poor boy.

VITO

(VITO reads the assignment.)

Answer in terms of h , g and the angular velocity of Earth's rotation, ω .

(AIRMAN Ω stands up. AIRMAN Ω heads to VITO. AIRMAN Ω reads the assignment.)

AIRMAN Ω

East.

VITO

Right?

AIRMAN Ω

Yeah...

(AIRMAN Ω raises their right hand. AIRMAN Ω directs their right arm towards the east.)

Right.



AIRMEN

(AIRMEN burst out laughing.)

(AIRMEN return to their seat.)

FALLACI

Don't worry about them. You will always have me as your special friend.

VITO

Special friends don't embarrass me in front of normal friends.

FALLACI

You embarrassed yourself in front of Giang.

(FALLACI exhaustedly lays back.)

VITO

Actually. It is a Motherly thing to do.

(FALLACI brightens.)

Another Motherly thing to do is to help me with girl problems.

FALLACI

Want to get in on a little theory?

(VITO listens closely to FALLACI.)

To impress the ladies...



VITO

(VITO interrupts.)

No. No. Less calculus involved...

(VITO points to the assignment.)

FALLACI

(FALLACI has a mocking attitude.)

I guess lay-D... Singular.

(VITO hands the assignment to FALLACI.)

VITO

I would love advices that are not in the least bit derivative.
It is integral.

FALLACI

From zero to a T. Giang could not be able to solve your
hypothetical problem. Perhaps, we eliminate that problem all
together by force?

(VITO does not like the sound of it.)

Let's factor in... Not you since you were used as an example... Your
Mother. She is skydiving back to Earth. To the center of your
world. I will solve this for you. Omega direction is omega Y
direction.

(AIRMAN Ω briefly glances at FALLACI.)

Nu direction is free-fall acceleration, which is?

VITO

Negative nine point eight one.



FALLACI

You experienced it. Times T as in time and Z direction. Coriolis force is negative two of ω direction by ν direction. Which would get?

VITO

Negative two times... ω ... Times free-fall acceleration times T in X direction.

FALLACI

That is ν . Not going to be derivative. Integral...

VITO

From zero to a T ... On time. Gets you X equalling negative one-third times... ω ... Times free-fall acceleration times T to the third power. Height is one-half times free-fall acceleration times T to the second power. Time equals two multiplied by height over free-fall acceleration all to the half-power. Input those in and the deflection is right.

FALLACI

East, you mean?

(VITO takes the assignment back from FALLACI. VITO looks away from FALLACI.)

FALLACI

What's left?

(VITO flips the assignment to the diagram. VITO hands the assignment to FALLACI.)



FALLACI

The equation for motion for this *sphere* in a *circular* path is free-fall acceleration cosine angle from the vertical plus parentheses length of spring plus x parentheses to the second power times the vertical angle to the second power plus same parentheses but multiplying sine squared angle from the vertical with azimuthal angle to the second power and subtracting X times initial *rotation omega* squared of that.

VITO

(VITO feels trapped.)

What about the Lagrangian...

(FALLACI contemplates.)

FALLACI

VITO

*(FALLACI expresses
frustration.)*

I don't recall that theorem.
Why would they apply functions
to generalized coordinates?

Just take the L as factor.

Newtonian mechanics was the
bastion of time derivatives.

Quantum mechanics has taken
foothold as operators.

At least Hamiltonian mechanics
is dead?

VITO

Let's just let this fly...

*(FALLACI frustratingly folds the assignment into a
paper airplane.)*

(AIRMAN B partners with AIRMAN Ω .)



(AIRMAN I partners with AIRMAN Z.)

(AIRMAN B and AIRMAN Ω move and turn their chairs so that when AIRMAN B sits, AIRMAN B faces forward while when AIRMAN Ω sits, AIRMAN Ω faces the back of AIRMAN B.)

(AIRMAN I and AIRMAN Z move and turn their chairs so that when AIRMAN Z sits, AIRMAN Z faces forward while when AIRMAN I sits, AIRMAN I faces the back of AIRMAN Z.)

FALLACI

(FALLACI glides the paper airplane to VITO.)

Here is something you could play with while I fly us.

(FALLACI shifts her chair forward.)

(VITO places and turns his chair so that when seated, VITO faces the back of FALLACI.)

