MISSION OPERATIONS MANAGER.

CAN YOU HELP ME WITH DYNAMICS?

SYNOPSIS

A motherly commander tries to assist one of her space cadets, and possible command pilot, on their astrodynamics assignment. Though their missions would just be to stare down at the world, the commander keeps being blindsided by the constant flatlining.

CHARACTER BREAKDOWN

Character	Gender	Age
FALLACI	Female	40s
The commander of the latest group selected to fly spacecraft. An experienced skydiver and former Mission Operations Manager.		
VITO	Male	20s
The top aviator *on* the world, who needs to work on his dynamics. He has a crush on the astrodynamics instructor.		

[Astronaut Crew Quarters in Space Center]

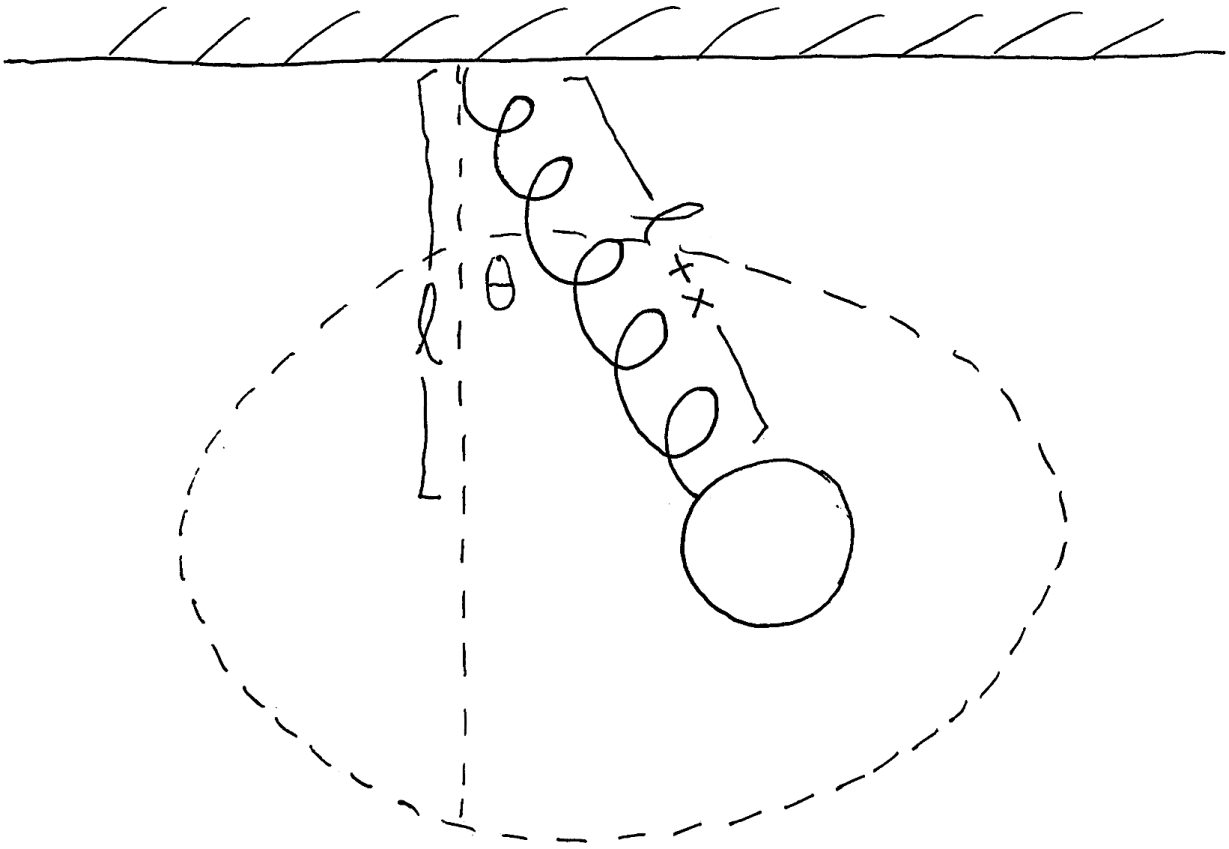
[A page of the assignment contains texts that are handwritten or printed from a typewriter:

"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.]

(VITO, with an assignment in hand, and FALLACI sit together.)

FALLACI

The astrodynamics instructor seems kind of cute.

VITO

(VITO feels unnerved.)

Acute.

FALLACI

Why so obtuse? Vito?

VITO

I passed the physical with flying colours. Commander Fallaci.

(VITO focuses on the assignment.)

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 times E to negative two T plus B times E 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

(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 (cont.)

You poor poor boy.

VITO

(VITO reads the assignment.)

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

FALLACI

East.

VITO

Right?

FALLACI

Yeah…

(FALLACI raises her right hand. FALLACI directs her right arm towards the east.)

Right. *(FALLACI burst out laughing.)*

VITO

Commander. Can you not direct me to the edge like the other space cadets…

FALLACI

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

VITO

Special friends don't reveal that *I am aware the world is flat* in front of normal friends.

FALLACI

You flatlined yourself in front of the astrodynamics instructor.

(FALLACI exhaustedly lays back.)

VITO

Actually. It is a Mission-Operations-Managerly thing to do.

(FALLACI brightens.)

Another motherly… *MISSION-OPERATIONS-MANAGERLY* 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 feels uncomfortable.)

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. 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 omega direction by nu direction. Which would get?

VITO

Negative two times… *Omega*… Times free-fall acceleration times T in X direction.

FALLACI

That is nu. Not going to be derivative. Integral…

VITO

From zero to a T… On time. Gets you X equalling negative one-third times… *Omega*… Times free-fall acceleration times T to the

VITO (cont.)

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.)

What's left?

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

(FALLACI expresses frustration.)

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

Newtonian mechanics was the bastion of time derivatives.

At least Hamiltonian mechanics is dead?

VITO

Just take the L as factor.

Quantum mechanics has taken foothold as operators.

VITO

Let’s just let this fly…

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

FALLACI

(FALLACI glides the paper airplane to VITO.)

Into the Sun!

[Blackout.]

[End of Play.]