Story:
Willy the Wizard used his power to slow down the earth.
At precisely midnight, GMT, on January 1st 2020, he struck his staff into the north pole and said “I command this planet that by this very time, one year precisely from today, all days will be 25 minutes long!”

Assume that the earth slows down at a constant rate over the course of the year 2002, and that January 1st 2021, and all days thereafter, are precisely 25 hours long.

Answer the following questions based on this story.

Problem 1:

What does this word mean?

μύθος

A. A hero
B. A story
C. A country
D. A horse

What does this word mean?

φόβος

A. Love
B. Strength
C. Fear
D. Intelligence

Problem 2:

Determine the angular acceleration of the earth during the year 2020 if Willy’s spell works. Please report your answer to six digits of accuracy!

Note that, under Willy’s spell, an *average day* in the year 2020 would last precisely 24 hours and 30 minutes.

[You can report your answer as positive or negative without worrying about vector direction.]

Problem 3:

How long would February 12th be if Willy's spell worked?
I recommend using *proportions* to help solve this problem.
Your answer should be accurate to the second.

Problem 4:

Determine the torque acting on the earth during the year 2020 if Willy's spell works.
You are allowed to ask Mr. Kuncik for two pieces of information to help you find the answer.

Assume the earth is a uniform sphere.

The rotational inertia of a uniform sphere is given by the formula

$$I = \frac{2}{5}MR^2$$

In which M is the mass of the sphere and R is the radius of the sphere
Please report your answer to 4 digits of accuracy

[You can report your answer as positive or negative without worrying about direction.]

Problem 5:
A person with a mass of 60 kg spends the entire year 2020 in the tiny nation of Equatorial Guinea, which is so named because the equator passes through it.
Determine the torque acting on this person during the year 2020.

Also, what other country is named because the equator passes through it?

Problem 6:
A person with a mass of 60 kg spends the entire year 2020 in the town of Mattapoisett, MA. Determine the torque acting on this person alone as a result of Willy's spell.

You may ask Mr. Kuncik for one piece of information, but you must explain what you will do with this particular information and why you need it.

Is the torque more or less than the person in Equatorial Guinea and why?

Problem 7:
A year must always be the amount of time it takes the earth to orbit the sun once. How many days are in a year after Willy's spell is over?

Problem 8:
Go back to reality (as though Willy's spell had never taken place) and answer this question:

Did the musical RENT take place in a leap year?

If you know nothing about this musical, I'm sure someone else in the room does.

Answers:

1. B, C
[Mythos and Phobos]

2. -9.011071727994032e-14 rad/sec^2

3. 24 hours, 7 minutes, 3 seconds

4. -8.756668021997918e+24 Newton-meters

5. -219.94310169117344 Newton-meters; Equador

6. -122.75778651518007 Newton-meters; the torque on this person is less because the moment arm is shorter. That is, this person is closer to the axis of the earth's rotation.

7. 350.64 days

8. No, 525,600 minutes is precisely 365 days, not 366 days.