

Q2 - Suppose the moon were held in its orbit not by gravity but by the tension in a massless cable. You are given that the period of the moon's orbit is $T = 27.3$ days, the mean distance from the earth to the moon is $R = 3.85 \times 10^8$ m, and the mass of the moon is $M = 7.35 \times 10^{22}$ kg.

What would the tension in the cable be?

The tension in the cable is providing the necessary centripetal force.

The angular velocity is given by

$$\omega = 2\pi/T = 2*3.14/(27.3*24*60*60) = 2.66*10^{-6} \text{ rad/sec.}$$

Hence the centripetal force or the tension in the cable is given by

$$F = m\omega^2 R = 7.35*10^{22}*(2.66*10^{-6})^2*3.85*10^8$$

Or $F = 2.0022*10^{20}$ N
