Answer on question #53465, Physics / Mechanics — Kinematics — Dynamics

Question   The mass of the Hubble Space Telescope is 11600 kg, determine the weight of the telescope (i) when it was resting on the earth and (ii) as it is in its orbit 598 km above the earths surface [hint: the earths radius = $6.38 \cdot 10^6$ m].

Solution   (i) On the Earth the weight will be

$$F = \frac{GM_{earth}m_{hubble}}{r_{earth}^2} = gm_{hubble} = 9.81 \cdot 11600 = 113796\,N$$

(ii)When it orbiting, its weight is equal to zero, as there is no reaction force. However, we can find gravitational force in this case

$$F = \frac{GM_{earth}m_{hubble}}{(r_{orbit} + r_{earth})^2} = \frac{6.67 \cdot 10^{-11} \cdot 5.97 \cdot 10^{24} \cdot 11600}{((6.38 + 0.598) \cdot 10^6)^2} \approx 95127.5\,N$$