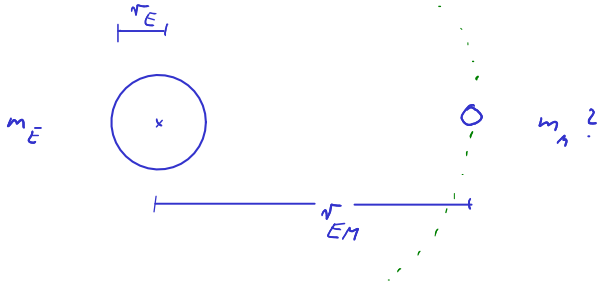
Wie bestimmt man die Masse des Mondes?



$r_{EM} \approx 384000\,km$

$m_E \approx 6 \cdot 10^{24}\,kg$

$\gamma = 6{,}67 \cdot 10^{-11}\ \frac{Nm^2}{kg^2}$

$F_G = \gamma \frac{m_E \cdot m_M}{r_{EM}^2}$

$T_M \approx 27{,}3\,d$

$r_E \approx 6400\,km$

$F_G = F_Z$

$\Leftrightarrow \gamma \frac{m_E m_M}{r_{EM}^2} = m_M \omega^2 \cdot r_{EM}$

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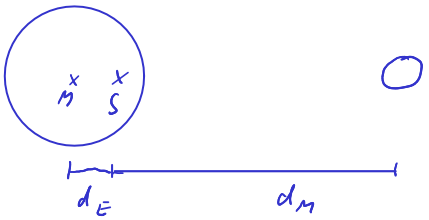
genauer:



„Schwerpunktsatz"

$m_E \cdot d_E = m_M \cdot d_M$

$\Leftrightarrow m_M = m_E \cdot \frac{d_E}{d_M}$

$d_M \approx r_{EM} \approx 384000\,km$

Schätze d_E (2 Werte) und berechne m_M!

z.B.:

$d_E = 6000\,km \Rightarrow m_M = 9{,}375 \cdot 10^{22}\,kg$

$d_E = 100\,km \Rightarrow m_M = 1{,}5 \cdot 10^{21}\,kg = 0{,}15 \cdot 10^{22}\,kg$

$d_E = 600\,km \Rightarrow m_M = 1 \cdot 10^{22}\,kg$

$\Rightarrow m_M \approx 5 \cdot 10^{22}\,kg$

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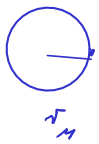
alternativ:

$g_M \approx \frac{1}{6} g_E$

$g_E = 9{,}81\ m/s^2$

$r_M = 1738\,km$

$m = 1\,kg$



(S. m_E – Bestimmung)

$m \cdot g_M = \gamma \frac{m\, m_M}{r_M^2}$

$\Leftrightarrow m_M = \frac{g_M r_M^2}{\gamma} \approx 7{,}39 \cdot 10^{22}\,kg$