1. (a) We locate the coordinate origin at the center of Earth. Then the distance r_{com} of the center of mass of the Earth-Moon system is given by

$$r_{\text{com}} = \frac{m_M r_M}{m_M + m_E}$$

where m_M is the mass of the Moon, m_E is the mass of Earth, and r_M is their separation. These values are given in Appendix C. The numerical result is

$$r_{\text{com}} = \frac{(7.36 \times 10^{22} \text{ kg})(3.82 \times 10^8 \text{ m})}{7.36 \times 10^{22} \text{ kg} + 5.98 \times 10^{24} \text{ kg}} = 4.64 \times 10^6 \text{ m} \ .$$

(b) The radius of Earth is $R_E = 6.37 \times 10^6$ m, so $r_{\text{com}} = 0.73 R_E$.