Extension of Example 10.3 from the text:

1. The International Space Station (ISS) is initially in circular orbit about the Earth. Find the effective potential of the ISS and sketch $U_{\text {eff }}$ as a function of $r$. Let the mass of the space station be $m_{\text {iss }}$.
2. If the ISS is in a stable orbit at $r_{0}$, find the angular momentum of the space station.
3. The captain notices a piece of space debris at the same altitude as the station and has no choice but to fire the boosters towards the Earth. What will be the motion of the station after this quick thrust? What will be the frequency of the oscillations about $r_{0}$ ? What is the equation for the radial position as a function of $\theta$ (polar angle of orbit around the Earth)?
4. If instead the ISS was in a decaying orbit (which does occur due to friction from Earth's atmosphere) and had fallen to a radial distance less than the desired stable orbit ( $r<r_{0}$ ), which direction should the boosters fire to return the ship to $r_{0}$ ?
