

$$\begin{aligned}
 f(m_c) &= \frac{4\pi}{G} \frac{(a_p \sin i)^3}{P_b^2} \\
 &= \frac{(m_c \sin i)^3}{((m_c + m_p)^2)} = 7.85(1) \times 10^{-10} \text{M}_\odot
 \end{aligned}$$