ADVANCED DYNAMICS — PHY 4241/5227

SOLUTIONS – SET 11

Problem 36: Momentum conservation in the rest frame (m rest mass):

$$c\,dm \;=\; m\,dv \;=\; m\,g\,d\tau\,.$$

Separation of variables gives (with initial mass m_0):

$$\int_{m_0}^{m(\tau)} = -\frac{g}{c}\int_0^{\tau} d\tau' \quad \Rightarrow \quad m(\tau) = m_0\,e^{-g\tau/c}\,.$$

After $\tau = 20$ years:

$$m(20\,\mathrm{y}) = 1.09\times 10^{-9}\,m_0\,.$$

End of spacetrip journey.