Problems Week 10

1. A particle follows the worldline $\bar{R} = \bar{R}(\tau)$. Is

$$\frac{d^2\bar{R}}{d\tau^2} + \alpha^2\bar{R} = 0$$

a reasonable equation of motion (α is real and non-zero)?

2. Integrate the equation

$$\frac{d\bar{A}}{d\tau} = \alpha^2\hat{v}$$

to find the most general form of the worldline that satisfies it.

3. Suppose that a spaceship moves along the worldline (in a 2-plane)

$$(\bar{R} - \bar{R}_0)^2 = \frac{1}{\alpha^2} \,,$$

with α a constant. Relate the proper time on the spaceship τ to that of an unaccelerated observer.