# Modern Physics - Spring 2025 - Assignment #1

**Due Monday, 27 January 2025, in class**

1. Interstellar travel: According to the pilot of a rocket traveling from Earth to the brightest star in our night sky (Sirius, which is $8.60c \cdot \text{yr}$ away), it takes 7 years to get there. How much time passes on Earth during this trip?

2. Time dilation / length contraction: A rocket is moving with speed $v$ with respect to an observer on the ground. Suppose the rocket passes by this observer at time $t = t' = 0$. **(a)** For which value of $v$ will the rocket observer's clock fall behind the ground observer's clock by 1 second per hour, i.e. for which $v$ does $t - t' = 1s$ for $t = 1$ hour? **(b)** For this value of $v$, if the rocket's *proper* length is 25m, how long does it appear in the ground observer's frame?

3. TEXTBOOK, Problem 1.22

4. TEXTBOOK, Problem 1.26

5. TEXTBOOK, Problem 1.32

6. TEXTBOOK, Problem 1.33

7. TEXTBOOK, Problem 1.42