

**Assignment #4**

1. This question concerns the Batmobile "Paradox", in which Batman is speeding towards Alfred's garage at  $v = 0.866c$ .
  - a) If the Batmobile's length according to Batman is  $4m$ , what is its length according to Alfred? (You need to use the length contraction formula  $\gamma L' = L$ .)
  - b) Alfred's garage is  $4m$  long. According to Batman in the Batmobile, how long is it?
  - c) Alfred thinks he can momentarily trap the Batmobile inside the garage by shutting both front and rear doors at the same time. Explain why he thinks he can do this. Batman thinks the Batmobile cannot be trapped completely inside the garage. Explain why he thinks this is so.
  - d) Explain in your own words why there is no absolute fact of the matter who is right.
  - e) Suppose Batman wants to find out if there is an absolute fact of the matter by slamming on the Bat-brakes right before he hits the rear door. Supposing the Bat-brakes are capable of bringing the Batmobile to a halt instantaneously, what will both Batman and Alfred see as a result?
  
2. What is the apparent paradox associated with the traveling Twins? Why is it really not a paradox?