Engineering Mechanics: Dynamics
CIEG311 - Fall 2001
Project #2: Lance Armstrong - Analysis of a Cycling "Machine"

Lance Armstrong won his third Tour de France this past summer in dramatic fashion. After a slow start he over took the competition in Stage 13 and never looked back.

In watching one of the final time trials, the ESPN commentator made the comment that Armstrong normally pedals in the 90-95 rpm range, and that this was very fast compared to the competition. Watching Armstrong, it was obvious that he was pedaling much faster than any of his closest competitors. The goal of this project is to conduct a theoretical analysis of Armstrong's performance and to compare it to one of his "typical" competitors.

Here we will assume the following: at cruising speed, Armstrong pedals at 95 rpm's and his typical competitor pedals at 85 rpm's. From a dead start in a time trial, it takes approximately 15 seconds for Armstrong, and his competitor, to reach their cruising speeds (we will neglect the ramp used at the start of a time trial).

Based on this and any other information you need to gather, and assumptions you need to make, answer the following questions:

- What is Armstrong's speed in miles-per-hour when he is cruising, i.e., pedaling at 95 rpm.
- What is his competitor's speed in miles-per-hour when he is cruising, i.e., pedaling at 85 rpm.
- Calculate and plot Armstrong's velocity and acceleration during the first 25 seconds of the time trial.
- Calculate and plot his competitor's velocity and acceleration during the first 25 seconds of the time trial.

Complete each of these calculations for <u>two</u> different gear ratios, for both Armstrong and the competitor (use similar ratios for Armstrong and the competitor).

Assume Armstrong and the competitor ride the exact same type of bicycle (i.e., same gears, same wheel diameters, etc.).