Consider the Honda Civic, a 5-place road car that is 177.3 in. long, 69.0 in. wide, 56.5 in. high, and weighs 2608 lb. (empty – might want to add a reasonable payload to this). The spec engine for this car has a 4-cylinder inline arrangement, a displacement of 1798 cc, a compression ratio of 10.6, a bore to stroke ratio of 0.928, and is naturally aspirated. Its rated maximum torque is 128 ft·lb at 4300 rpm (mechanical efficiency 0.94). Its rated maximum power is 140 hp at 6500 rpm (mechanical efficiency 0.89). Transmission primary reduction is 1:1, and gear ratios are 3.143 in 1st (lowest gear) and 0.727 in 5th (highest gear), with a 4.29 final drive ratio. To cruise at 70 mph on a flat, smooth road requires 29 hp. For performance calculations, consider the paint color to be Dyno Blue Pearl. In use, parts of the rear seat have become a little sticky.

So sticky, that the Suitable Transportation For Household Teenagers Department has given up the GV as a total loss, and the remains have been turned over to the Let’s Make A Track Car Out Of It Department. LMATCOOI has decided to replace the trailing arm rear suspension with double wishbone. This is going to take a lot of welding, and so it is important to get the design right the first time.

1. Determine a suitable wheel spring rate and wheel damping coefficient so that the GV has two inches of droop and is critically damped. Report the numbers and analysis.

2. Create an arrangement of control arms that give the GV’s rear end one degree of camber gain per degree of body roll, and a roll center 4 inches above the deck at ride height. Show a simple figure with dimensions, plus analysis.

3. Determine appropriate springs and dampers. For springs, the whole spring design. For dampers, just the damper damping coefficient.