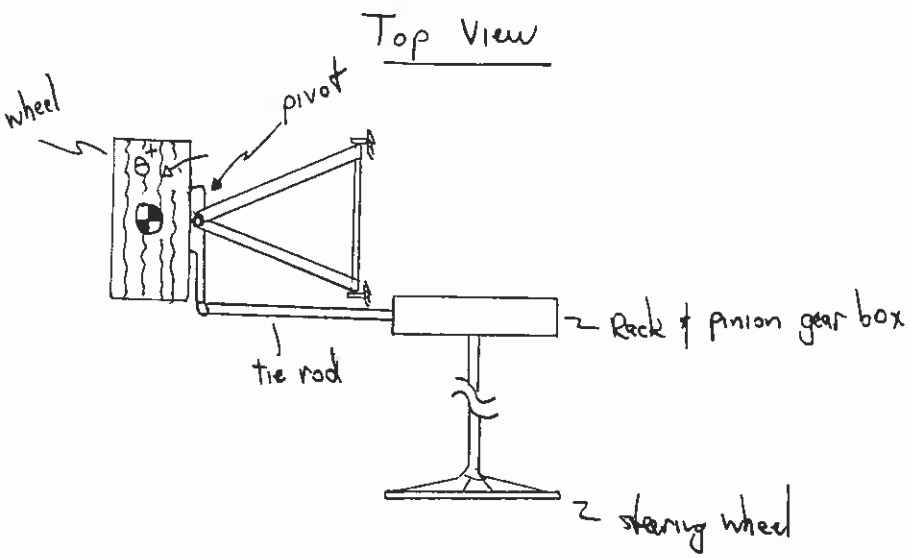
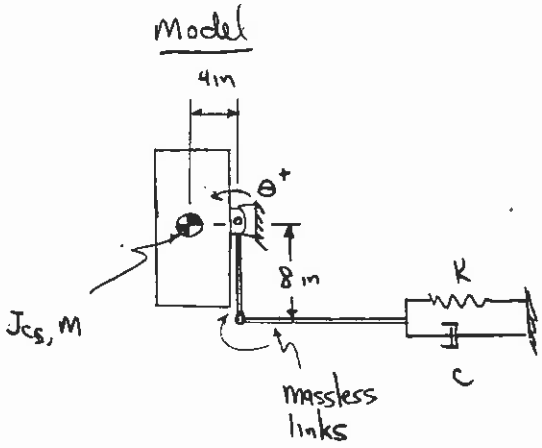
2. 30 pts. A steering and suspension system is shown for the front left wheel of a Formula *SAE* race car. Using the dynamic model shown, determine:

a). The differential equation of motion in θ.

b). The damping ratio ζ.

c). Sketch (no numbers!) the response of the system $\theta(t)$ given an initial condition of $\dot{\theta}_o$, simulating an impact on the front of the tire ($\theta_o = 0$).





$K = 300\ lb/in$

$C = 4\ lb\ sec/in$

$m = 0.0518\ lb\ sec^2/in$

$J_{cg} = 0.800\ lb\ sec^2\ in$

3

20 pts

2.71 Find the equation of motion of the uniform rigid bar OA of length l and mass m shown in Fig. 2.86. Also find its natural frequency.

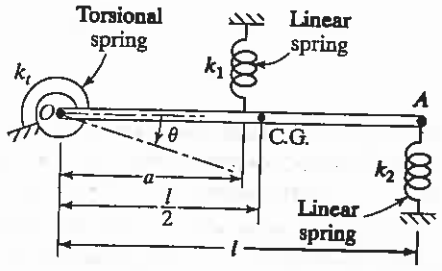


FIGURE 2.86

5. 20 pts. Find the equation of motion and effective mass and stiffnesses of the system below. Include gravity.