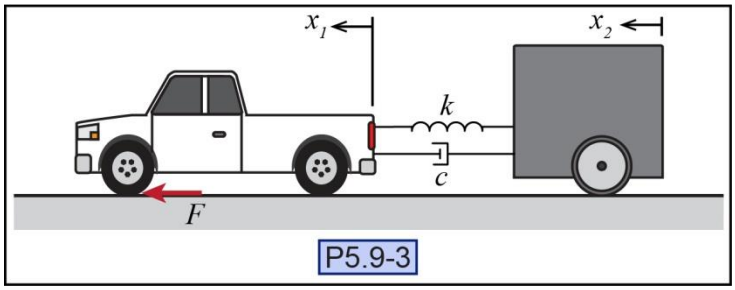
P5.9-3) Consider the accompanying figure of a truck pulling a trailer. The coupling between the truck and trailer is modeled as having stiffness k and damping c and the front-wheel drive truck is propelled forward by the force F at the road/tire interface. You may neglect rolling resistance, air drag, etc. The truck has mass m and the trailer has mass M, while their respective positions x_1 and x_2 are zero from the point that the spring representing the coupling is at its free length. Determine the differential equations of motion for both the truck and the trailer.



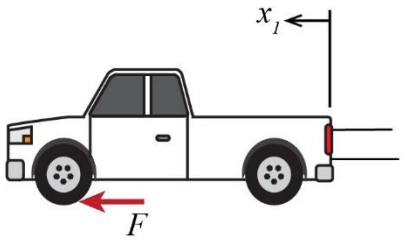
P5.9-3

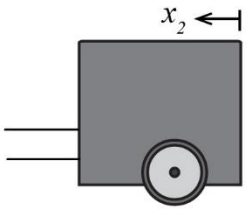
Given:

Find:

Solution:

Draw a free-body diagram for the truck and the trailer.





Write down the equation of motion of the truck in terms of $x, \dot{x}, \ddot{x}$.

Write down the equation of motion of the trailer in terms of $x, \dot{x}, \ddot{x}$.