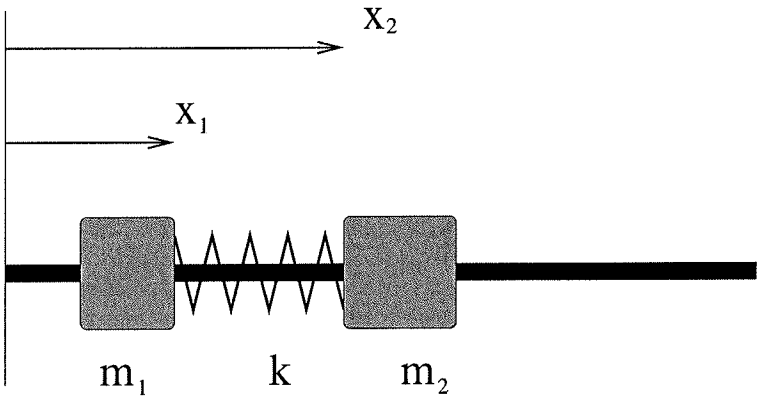
Classical Mechanics

1. Two masses, m_1 and m_2, are connected together by an ideal massless spring of spring constant k and equilibrium length l, but are otherwise free to slide on a straight frictionless rail. Their positions with respect to a fixed origin are denoted x_1 and x_2 respectively.



   (a) Determine the equation of motion for each mass using Newton's Laws of Motion. (Do not solve them yet.) [2 pts.]

   (b) Write the Lagrangian for this system and use it to derive the equation of motion for each mass. (Again, do not solve them yet.) [3 pts.]

   (c) Using either of your results, determine the frequency of oscillation of the two masses about their center of mass. [2 pts.]

   (d) Given the initial conditions, $x_1(0) = 0$, $v_1(0) = 0$, $x_2(0) = l$ and $v_2(0) = v_0$, solve for the subsequent motion. [3 pts.]

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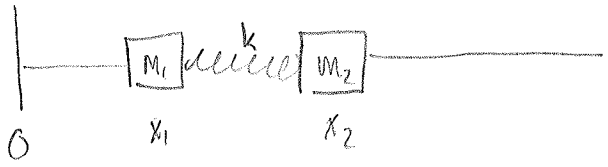
Classical #1



* Rail is friction less

a) Determine equations of motion using Newtons Laws

$$F = k\Delta x = ma$$

$$\Rightarrow m_1\ddot{x}_1 = k($$