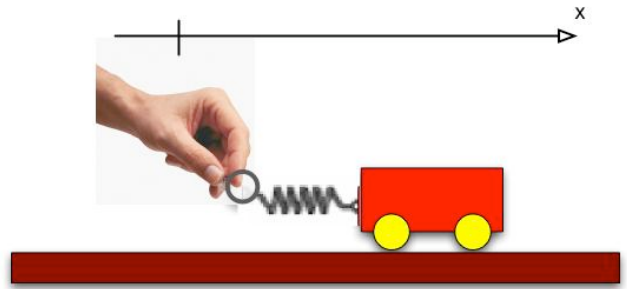A small cart with small nearly frictionless wheels is connected to a spring whose rest length is l_0.

Describe the position of the cart by a fixed coordinate system (1D) that has its origin as shown.

(a) A hand holds the other end of the spring and moves as a function of time,
$$x'(t) = A \cos \omega t.$$
Use Newton's second law to write a DE that governs the motion of the cart.

(b) Find a coordinate change that results in a simpler DE.

(c) Put the equation in standard form (with the terms containing the unknown on the left and those without it on the right and the term with the highest derivative having coefficient 1).
Can your equation be simplified?
Interpret the physical meaning of the constants.