Please answer the questions below to the best of your ability either in the space provided. Everything should be scanned or photographed and submitted through gradescope.com. Please make sure you dictate which parts correspond to which page after you upload!

Objective: *I can use simplifying models and the momentum principle to determine the impact time and forces involved in an interaction.*

1. In the classic grade school science experiment, students are charged with constructing a device in which an egg can be dropped from some height without being broken. Suppose you are dropping the egg contraption off the top of a 30 m building such that the velocity the moment before it hits the ground is $\langle 0, -24, 0\rangle$ m/s. For your protective contraption, you manage to suspend the egg (50 g) in the interior of a 15 cm radius balloon (which has mass 25 g).

(2) (a) Estimate the time to takes the egg contraption to come to a stop if the balloon can compress up until the egg would strike the ground. (Some air will need to escape in the process so we don't bounce like a ball...)

(2) (b) Estimate the net force acting on the egg balloon during this time.

(3) (c) Suppose the balloon's skin had a breaking force of 50 N. How much larger would the balloon need to be to ensure that it could compress without popping and keep the egg safe?

(3) (d) Determine and rationalize what assumptions or simplifications you made throughout the course of this problem.