WebAssign
Lab #10: Real vs. Point Particle System (Homework)

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Current Score : 2 / 2 **Due :** Tuesday, March 27 2012 11:59 PM EDT

1. 2/2 points | Previous Answers

A jumper of mass m=83 kg starts in a crouched position with the jumper's center of mass at a position y_1=0 m. Just before the jumper leaves the floor, his or her center of mass is at y_2=0.6 m. From another measurement, you have found that the velocity of the jumper's center of mass has only a y component of v_2=2.3 m/s as the jumper's feet leave the floor.

Use your results from this lab to calculate how strong the floor must be to support this jump.

F_{floor}= 1179.43 N

Now assume F_{floor} changes while the jumper goes from the crouched to the lift-off position. While the jumper's feet are in contact with the floor assume the force decreases linearly or

$F_{floor}(y) = -C[y-(y_2-y_1)]$,

where y is the changing position of the center of mass, and C is a positive constant. Note that when $y=y_2-y_1$ this force goes to zero and, of course, once the jumper's feet leave the floor this force of the floor on the jumper must be zero.

For the initial conditions above, find the maximum value of F_{floor} and so the required strength of the floor.

$F_{floormax}$ = 2358.58 N

Hint: You will have to integrate the force over the displacement to find the work and from that and the energy principle you can find the constant C. Once you know C it is straightforward to find the maximum value of F_{floor}.