0. **(0 points)** /opt/webwork/webwork2/conf/snippets/ASimpleCombinedHeaderFile.pg

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Assignment PHY141_WW7 due 10/28/2022 at 11:59pm EDT

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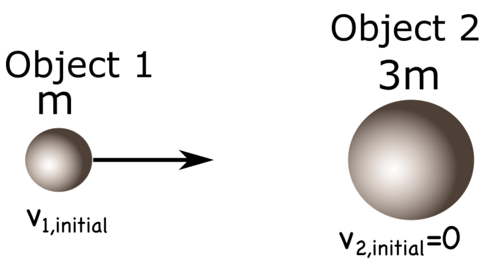
1. **(2 points)** setPHY141_WW7/comframe.pg

On transfering to the center of mass frame



A particle of mass m (object 1) has initial velocity $v_{1,initial} = V_0$. It collides with a particle of mass $3m$ (object 2) that is initially at rest.

The collision takes place in 1 dimension (along a line). Velocities are not relativistic. Objects moving to the right correspond to positive velocities.

What is the velocity of the center of mass?

Enter a value for V_{cm}: ___ V_0

Transfer to a center of mass frame. In this frame the center of mass is stationary.

What is the initial velocity $v'_{1,initial}$ of object 1 in the center of mass frame?

Enter a value for $v'_{1,initial}$: ___ V_0

What is the initial velocity $v'_{2,initial}$ of object 2 in the center of mass frame?

Enter a value for $v'_{2,initial}$: ___ V_0

If the collision is elastic what is the velocity of object 1 after the collision in the center of mass frame?

Enter a value for $v'_{1,final}$: ___ V_0

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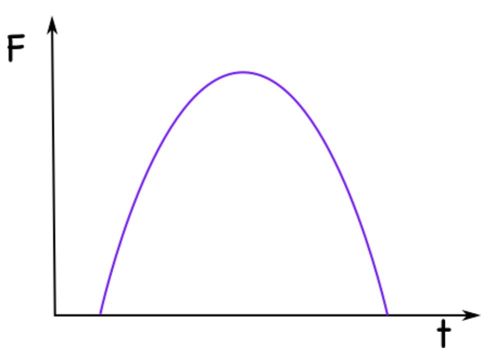
2. **(1 point)** setPHY141_WW7/pulse.pg

On a force pulse



A short force pulse, decribed by $F(t)$, is applied to a non-relativistic particle of mass m.

The force is a function of time

$$F(t) = \begin{cases} 0 & \text{for } t < 0 \\ F_0 \sin(\omega t) & \text{for } 0 \le t < \frac{\pi}{\omega} \\ 0 & \text{for } t \ge \frac{\pi}{\omega} \end{cases}$$

and is only applied between $t = 0$ and $t = \pi/\omega$.

The particle mass is $m = 1$ kg, the coefficient $F_0 = 1$ N and the coefficient $\omega = 1$ rad/s.

The momentum principal $F = \frac{dp}{dt}$ where p is the momentum.

This implies that a small change in momentum dp over a small length of time dt is $dp = F(t)\, dt$.

A total change in momentum between times t_1, t_2 is $\Delta p = \int_{t_1}^{t_2} F(t)\, dt$.

What is the total change in m's velocity, Δv, after this pulse has ended?

Enter $\Delta v =$ ___ m/s.

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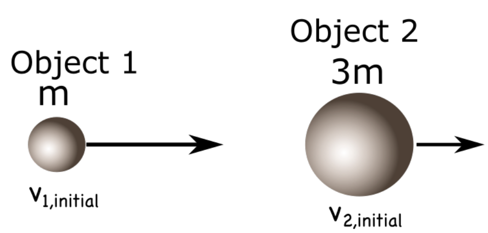
3. **(2 points)** setPHY141_WW7/anelastic.pg

An anelastic collision



Two masses, with initial velocity $V_{1,init} = 2$ m/s and $V_{2,init} = 1$ m/s approach each other and collide. The first mass $M_1 = 1$ kg and the second mass $M_2 = 3$ kg. The collision is not elastic. They stick together.

What is the velocity of the center of mass? $V_{cm} =$ ___ m/s

What is the velocity of the two masses after they stick together? $V_{final} =$ ___ m/s

What is the translational kinetic energy (that associated with the total mass and the center of mass velocity)? $K_{cm} =$ ___ J

What is the initial relative velocity $V_{2,init} - V_{1,init}$? ___ m/s (check your sign)

What is the reduced mass? $\mu =$ ___ kg

What is the amount of energy lost during the collision? $E_{lost} =$ ___ J