

UNIVERSITY OF ALABAMA  
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**Quiz 4: momentum and such**

1. A rubber ball strikes a brick wall with a velocity (just before the collision) of  $\vec{v}_i = 3.0\hat{i} + 4.0\hat{j}$  m/s. It rebounds with a velocity of  $\vec{v}_f = -3.0\hat{i} + 4.0\hat{j}$  m/s, *i.e.*, the collision was perfectly elastic. What can be said about the change in momentum of the rubber ball?

- The momentum  $\vec{p}$  did not change, since the collision was elastic.
- The momentum  $\vec{p}$  changed direction, its magnitude is the same.
- The momentum  $\vec{p}$  decreased.
- The momentum  $\vec{p}$  increased.
- The question cannot be answered, we do not know the mass of the ball.

2. Which of the following is in error?

- $\vec{F} = \frac{d\vec{p}}{dt}$
- $K = \frac{p^2}{2m}$
- $\vec{p} = m \frac{d\vec{x}}{dt}$
- $\Delta\vec{p} = \int \vec{F} \cdot d\vec{r}$

3. A 60 kg person standing on a frictionless surface fires a 0.5 kg arrow horizontally at 50 m/s. With what velocity does the archer move backwards across the ice after firing the arrow?

- $v_{\text{archer}} = +0.42$  m/s
- $v_{\text{archer}} = -0.42$  m/s
- $v_{\text{archer}} = -0.84$  m/s
- $v_{\text{archer}} = +0.84$  m/s

4. A ball of mass  $m$  is dropped from rest at a height  $h$ . What is the magnitude of the ball's momentum just before impact?

- $2mgh$
- $m\sqrt{gh}$
- $m\sqrt{2gh}$
- $\sqrt{2mgh}$