# Quiz 4: momentum and such

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

☐ The momentum $\vec{\mathbf{p}}$ did not change, since the collision was elastic.

☐ The momentum $\vec{\mathbf{p}}$ changed direction, its magnitude is the same.

☐ The momentum $\vec{\mathbf{p}}$ decreased.

☐ The momentum $\vec{\mathbf{p}}$ increased.

☐ The question cannot be answered, we do not know the mass of the ball.

**2.** Which of the following is in error?

☐ $\vec{\mathbf{F}} = \frac{d\vec{\mathbf{p}}}{dt}$

☐ $K = \frac{p^2}{2m}$

☐ $\vec{\mathbf{p}} = m\frac{d\vec{\mathbf{x}}}{dt}$

☐ $\Delta\vec{\mathbf{p}} = \int \vec{\mathbf{F}} \cdot d\vec{\mathbf{r}}$

**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?

☐ $2mgh$

☐ $m\sqrt{gh}$

☐ $m\sqrt{2gh}$

☐ $\sqrt{2mgh}$