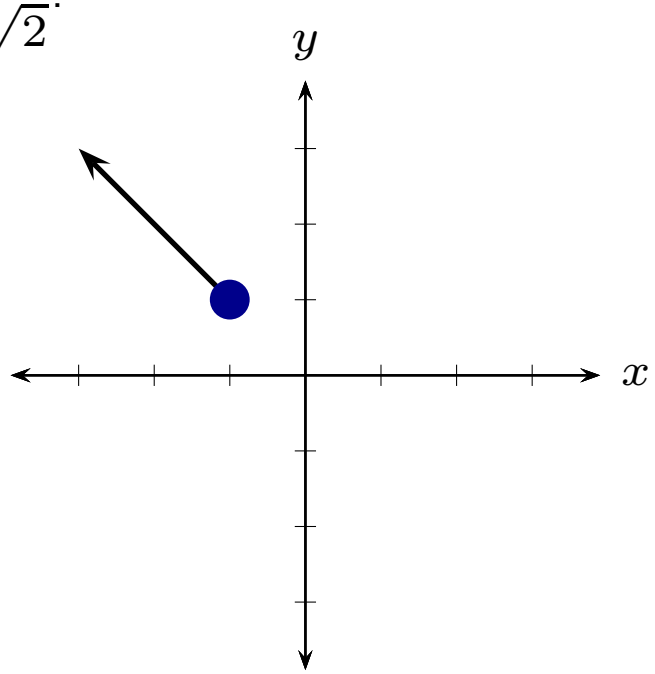
Question 1

A particle of mass m is observed from the unprimed frame to moves at a 45° angle between the x and y axes with speed $u = \dfrac{c}{\sqrt{2}}$.



Which of the following is true regarding the relativistic momentum of the particle?

1. $\mathrm{p} = -\dfrac{mc}{\sqrt{2}}\,\hat{\boldsymbol{i}} + \dfrac{mc}{\sqrt{2}}\,\hat{\boldsymbol{j}}$
2. $\mathrm{p} = -mc\,\hat{\boldsymbol{i}} + mc\,\hat{\boldsymbol{j}}$
3. $\mathrm{p} = -\dfrac{mc}{2}\,\hat{\boldsymbol{i}} + -\dfrac{mc}{2}\,\hat{\boldsymbol{j}}$
4. $\mathrm{p} = +\dfrac{mc}{\sqrt{2}}\,\hat{\boldsymbol{i}} + \dfrac{mc}{\sqrt{2}}\,\hat{\boldsymbol{j}}$
5. $\mathrm{p} = +mc\,\hat{\boldsymbol{i}} + mc\,\hat{\boldsymbol{j}}$

Question 2

A object of mass m moves with speed u.

As $u \to c$,

1. $E \to 0$
2. $E \to mc^2$
3. $E \to mc^2 + \frac{1}{2}\, mc^2$
4. $E \to \infty$

Question 3

An energetic particle emits a photon. The process is viewed from the rest frame of the particle before emission and the photon travels to the left.

Which of the following is true after emission?

1. The atom is stationary.
2. The atom moves left.
3. The atom moves right.