

Chapter 3 (Relativistic Four Vectors)

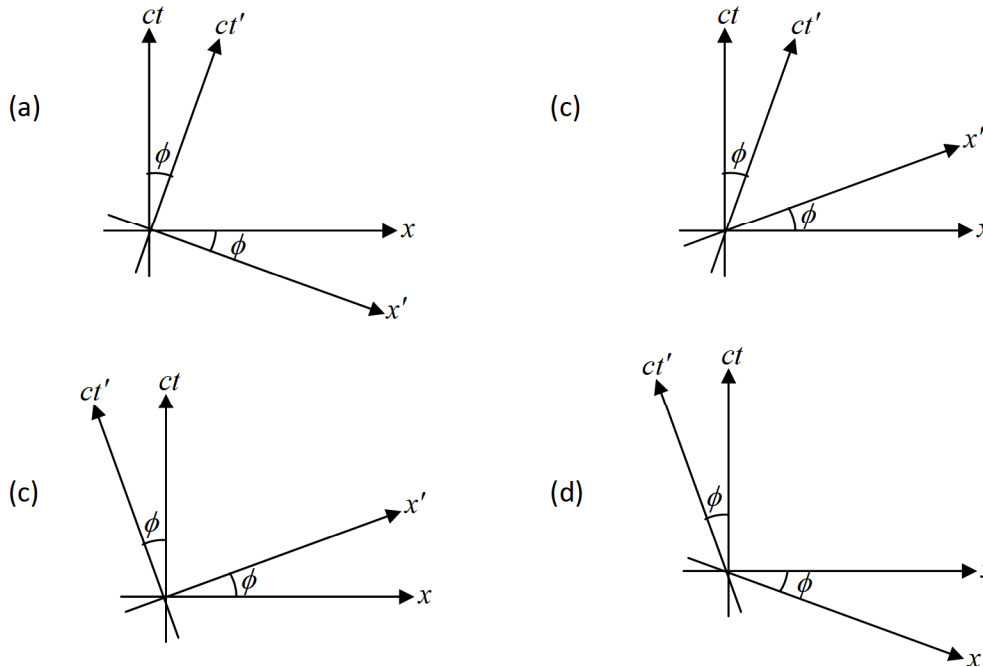
PYQ [NET-JRF]

- Q1. Consider a radioactive nucleus that is travelling at a speed $\frac{c}{2}$ with respect to the lab frame. It emits γ -rays of frequency ν_0 in its rest frame. There is a stationary detector, (which is not on the path of the nucleus) in the lab. If a γ -ray photon is emitted when the nucleus is closest to the detector, its observed frequency at the detector is

- (a) $\frac{\sqrt{3}}{2} \nu_0$ (b) $\frac{1}{\sqrt{3}} \nu_0$ (c) $\frac{1}{\sqrt{2}} \nu_0$ (d) $\sqrt{\frac{2}{3}} \nu_0$

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- Q2. An inertial frame K' moves with a constant speed v with respect to another inertial frame K along their common x -direction. Let (x, ct) and (x', ct') denote the space-time coordinates in the frames K and K' , respectively. Which of the following space-time diagrams correctly describes the t' -axis ($x' = 0$ line) and the x' -axis ($t' = 0$ line) in the x - ct plane? (In the following figures $\tan \phi = v/c$)



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