Question 1

A rocket travels with velocity $\frac{3}{5}c$ to the right respect to a space station. Observers in the space station observe an asteroid traveling to the left with speed $\frac{4}{5}c$ with respect to the space station.

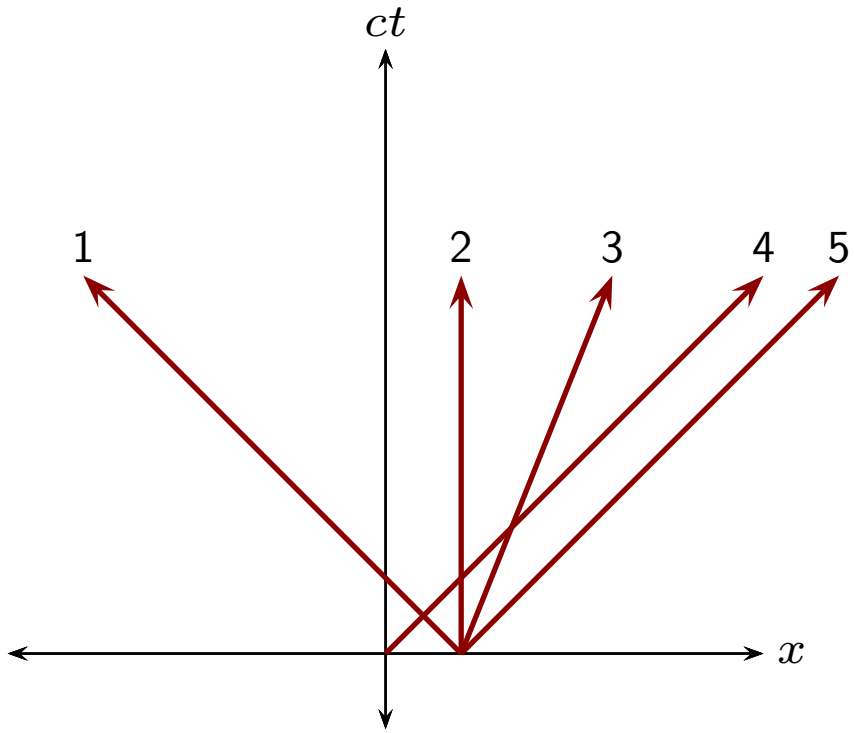
Which of the following is true of the speed of the asteroid as observed from the rocket?

1. Galilean: less than c, SR: less than c
2. Galilean: less than c, SR: more than c
3. Galilean: more than c, SR: less than c
4. Galilean: more than c, SR: more than c

Question 2

A flash of light leaves from the location $x = 1\,\text{lt·yr}$ at $t = 0\,\text{yr}$ in the unprimed frame. It travels to the right.

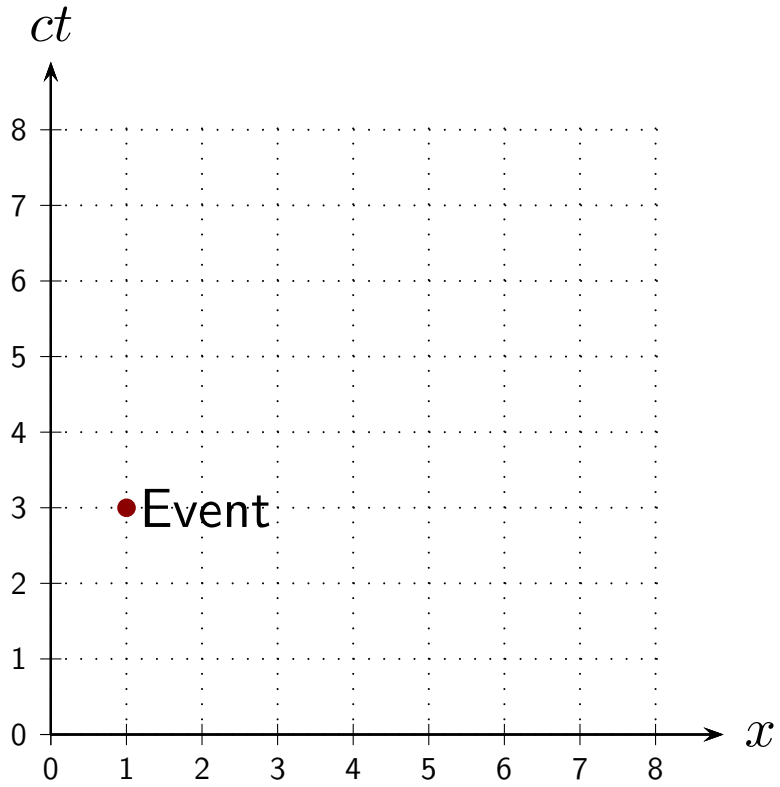
Which best represents the path of the light on the spacetime diagram?



Unprimed Observer

Unprimed observer grid. The indicated event is at

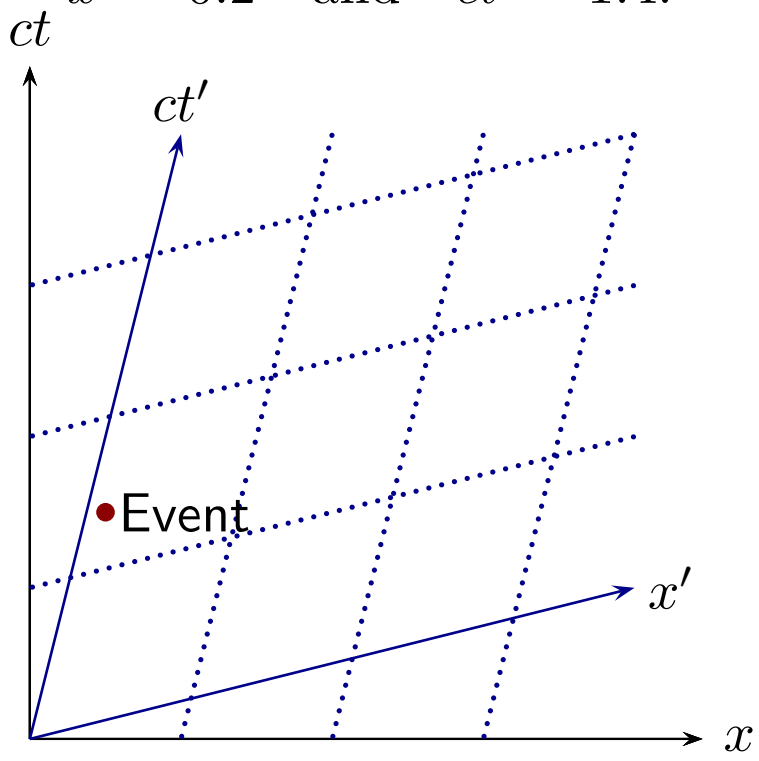
$$x = 1 \quad \text{and} \quad ct = 3.$$



Primed Observer

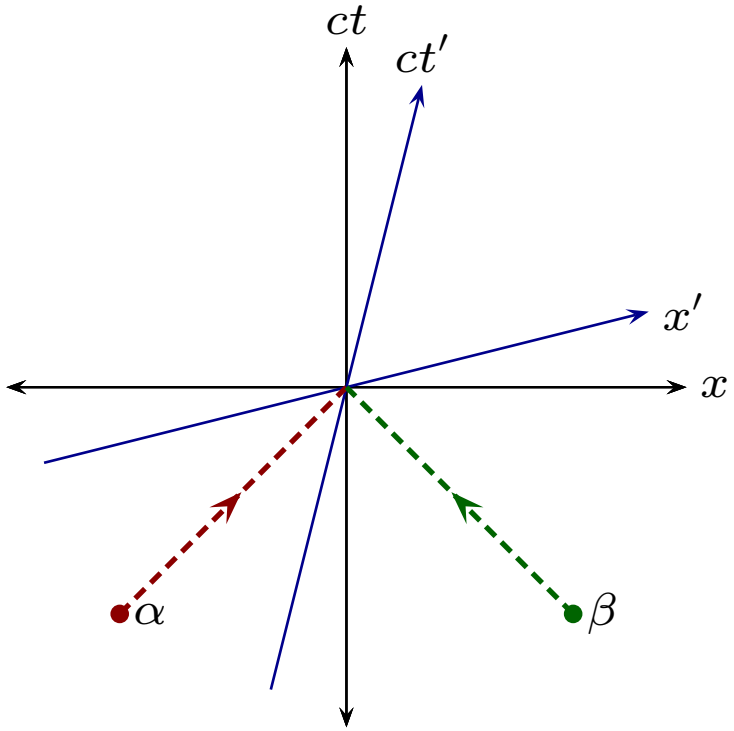
Primed observer grid.The indicated event is at

$$x' = 0.2 \quad \text{and} \quad ct' = 1.4.$$



Question 3

The spacetime diagram for the double supernova situation is as illustrated.

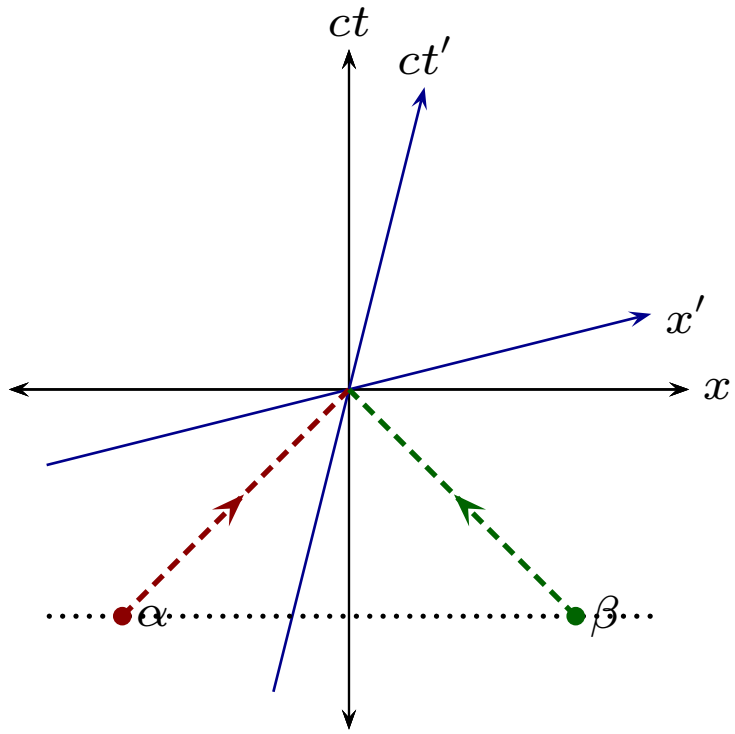


According to this which of the following is true for the times of the events?

1. α, β same unprimed, same primed.
2. α, β same unprimed, α earlier primed.
3. α, β same unprimed, β earlier primed.
4. α earlier unprimed and unprimed.
5. β earlier unprimed and unprimed.

Unprimed frame

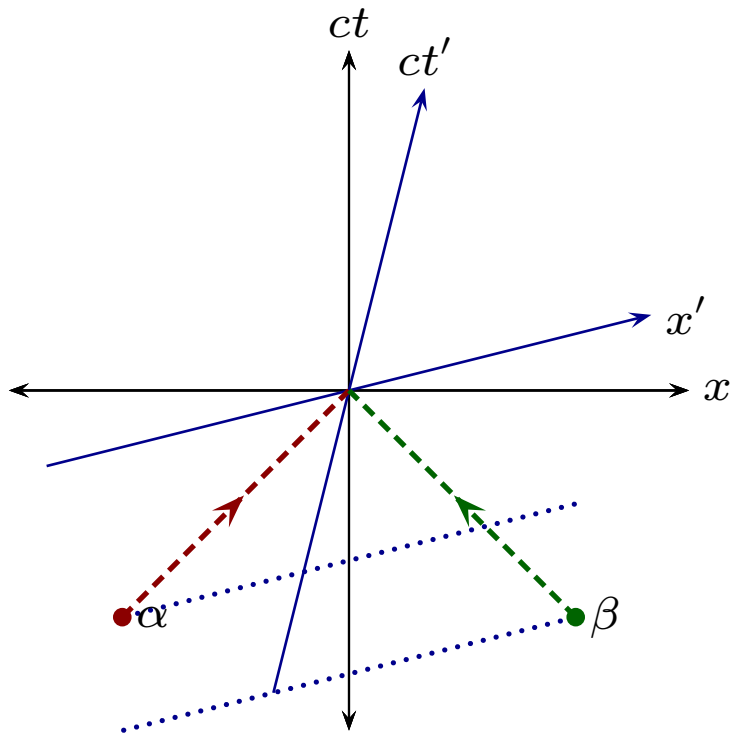
Lines parallel to x axis indicate times.



Intersect ct axis at same point. Thus same times in unprimed.

Primed frame

Lines parallel to x' axis indicate times.



Intersects ct' axis at higher point for α than β. β earlier in primed