Barbara is boiling an egg in her spaceship's kitchen. Using her kitchen timer she measures 100 seconds from the moment the water boiled (Event I) to when the egg was done (Event II).

Which of the following is true?

A) You cannot boil an egg in a moving spaceship

B) If the spaceship is moving fast enough, a stationary observer might see Event II before Event I

C) There exist an observer moving with a non-zero speed with respect to Barbara who sees Events I and II as occurring in the same place

D) There exist an observer moving with a non-zero speed with respect to Barbara who sees Events I and II as occurring at the same time

E) All observers will see Event I before Event II

Barbara is boiling an egg in her spaceship's kitchen. Using her kitchen timer she measures 100 seconds from the moment the water boiled (Event I) to when the egg was done (Event II).

Which of the following is true?

A: The events are timelike separated, so they are in the same order no matter who observes them

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B) If the spaceship is moving fast enough, a stationary observer might see Event II before Event I

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E) All observers will see Event I before Event II

Same setup:

Barbara is boiling an egg in her spaceship's kitchen. Using her kitchen timer she measures 100 seconds from the moment the water boiled (Event I) to when the egg was done (Event II).

If the spaceship is moving with speed 0.6c with respect to the Earth, what is the spacetime interval s^2 separating Events I and II **as seen on Earth**?

A) 12500 s^2

B) 1.125 10^{11} m^2

C) 10000 s^2

D) 9 10^{10} m^2

E) 100s

Same setup:

Barbara is boiling an egg in her spaceship's kitchen. Using her kitchen timer she measures 100 seconds from the moment the water boiled (Event I) to when the egg was done (Event II).

If the spaceship is moving with speed 0.6c with respect to the Earth, what is the spacetime interval s^2 separating Events I and II **as seen on Earth**?

A) 12500 s^2

B) 1.125 10^{21} m^2

C) 10000 s^2

D) 9 10^{20} m^2

E) 100s

The spacetime interval is the same in all frames of reference. It's easy to compute in Barbara's frame:

$s^2 = (c\Delta t)^2 - (\Delta x)^2 = c^2(100s)^2$

Four scientists have gone off to explore the universe and meet up later for some beers. When they get back together, who has aged the most?

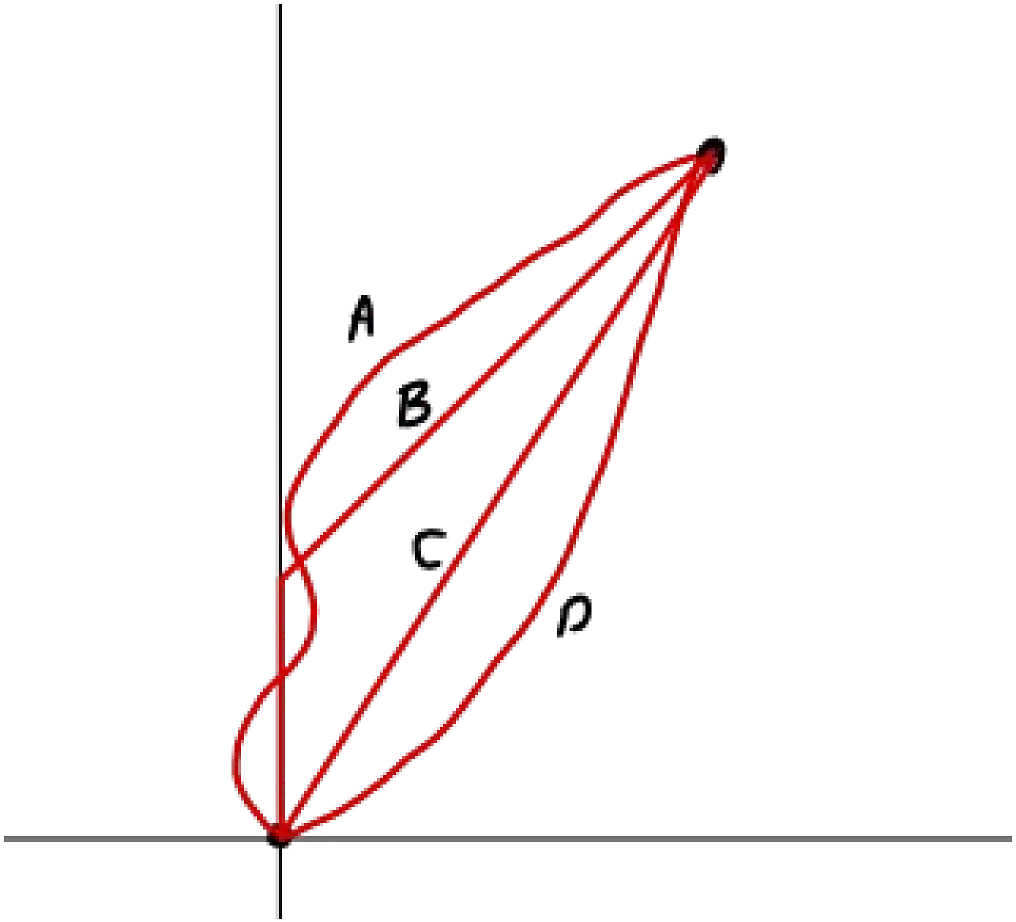
A)   A

B)   B

C)   C

D)   D

E) they have all aged the same because they start and end in the same place



Four scientists have gone off to explore the universe and meet up later for some beers. When they get back together, who has aged the most?

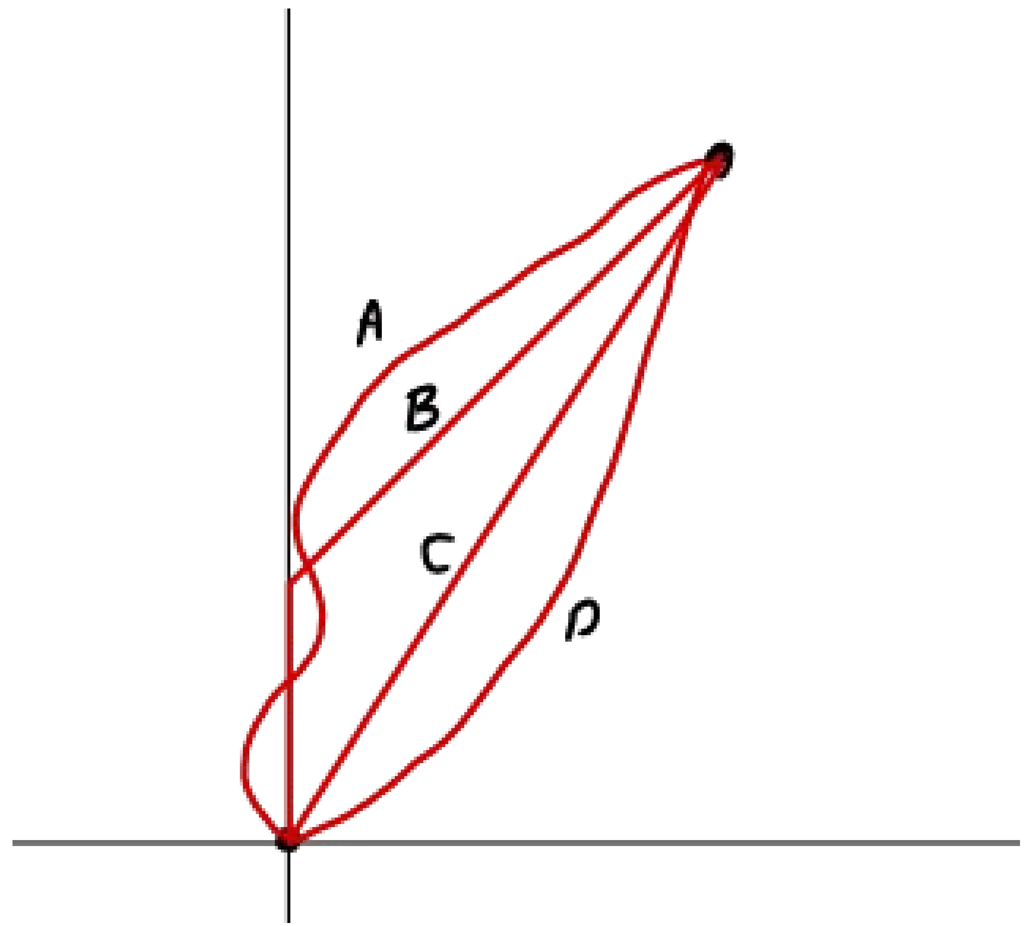
A) A

B) B

C) C

D) D

E) they have all aged the same because they start and end in the same place



In C's frame of reference, everybody but C is moving, so everybody but C has nonzero speed. Therefore, $\sqrt{1-u^2/c^2} < 1 \Rightarrow$ LESS PROPER TIME for everyone but C.

A very heavy ball with mass M is moving with speed u towards a light motionless ball with mass m. Assuming the collision is elastic, what is the speed of the light ball after the collision?

(use non-relativistic mechanics)

A) (M/m)u

B) u

C) (m/M)u

D) ((M-m)/(M+m))u

E) (2M/(M+m))u

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A) (M/m)u

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Use conservation of momentum and energy to solve (see lecture notes)