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# PHSX 343: Assignment 3

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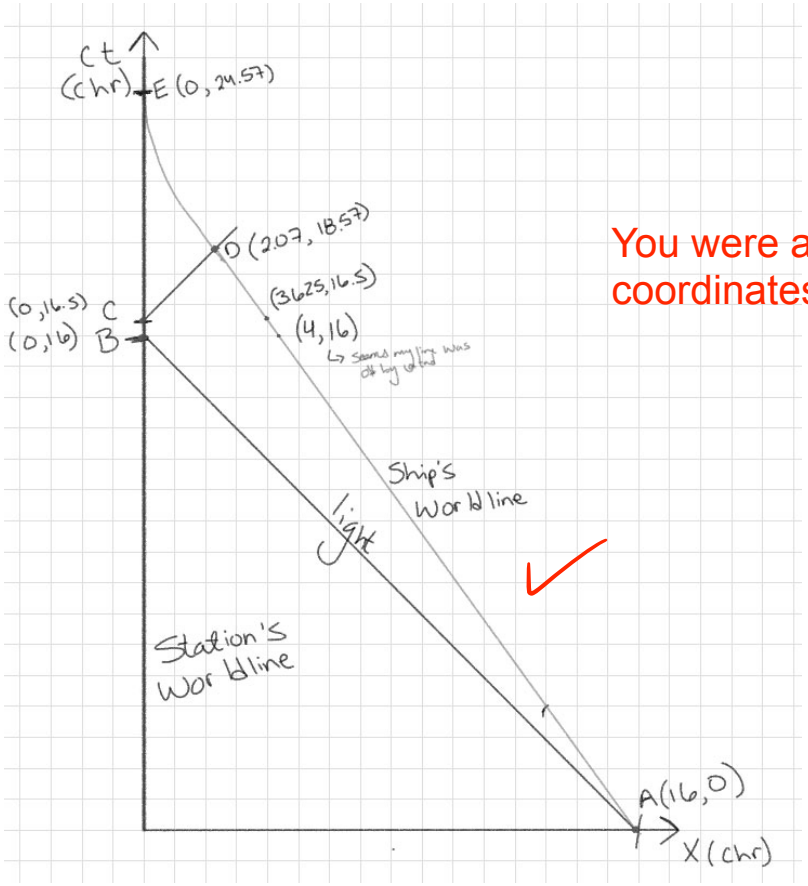
## Problem 1

+3

a)




You were asked to put these coordinates in a table.

To help get the location of the ship let's write the line it follows. Through simple geometry we get $ct = -\frac{4}{3}x + \frac{64}{3}$. Since light always travels with a slope of 1, event B will arrive at $ct = 16$. Event C happens half an hour later, at $t = 16.5$. Using a new line for the light leaving C, $ct = x + 16.5$,

the intercept becomes $x = 2.07$, $ct = 18.6$. We can do our best to draw a quadratic deceleration to $ct = 24.6$ as the ship comes in to land.

b)

$$x = x_0 + vt + \frac{1}{2}at^2 \rightarrow -2.07(c * hr) = -0.750c(6hr) + \frac{1}{2}a(6hr)^2$$

$$-2.07 = -0.750(6) + \frac{1}{2}a(36hr)\left(3600\frac{s}{hr}\right)\left(\frac{1}{c}\right)$$

Use a = Δv/Δt, much simpler

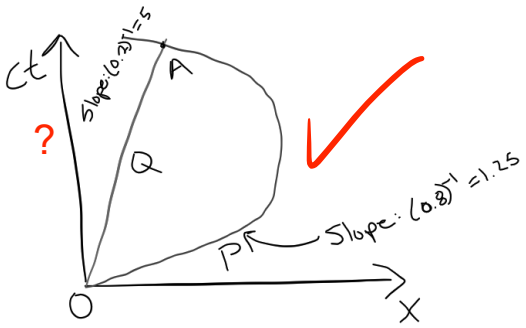
$$\frac{2c * (-2.07 + 0.75(6))}{(36)(3600)} = a\left[\frac{m}{s^2}\right]$$

$$a \approx 1.12x10^4\frac{m}{s^2} \approx 1.15x10^3 g$$

1.04 1.06

+4 **Problem 2**

a)



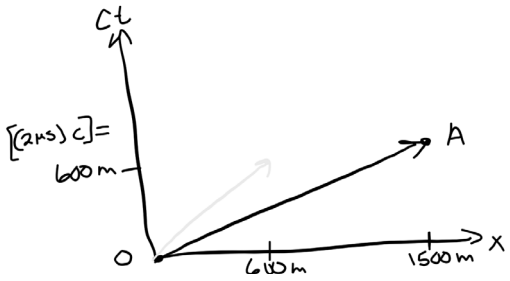

b) The two clocks will not necessarily read the same time as all our rules pertain to inertial frames, but the P frame is accelerating back towards $x = 0$, so it is not inertial.

c)

- Coordinate Time:
  O and A define a coordinate time as they are both inertial and one at each event
  Q is also defines a coordinate time as it is present at each event and traveling at a constant speed.
  P does not define a coordinate time as it is not an inertial frame

- Proper Time:
  O and A do not define a proper time as they are different clocks at different events
  Q and P each independently define proper time as they are each at the event and are one clock. The definition does not include needing to be inertial.
- $\Delta/c$:
  Q is the only clock that defines $\frac{1}{c}$ time as it is the only clock that is at both events and is inertial.

## +4 Problem 3




$$v = \frac{1500m}{2.00x10^{-6} * c} = 2.5c$$

To be at both the origin and event A, something would have to travel 2.5 times the speed of light, so a light pulse could not travel between the two.