Our Problem Set 1

This was originally from the Denver group meetings and has the Qzzyyxxx.

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Autosave disabled
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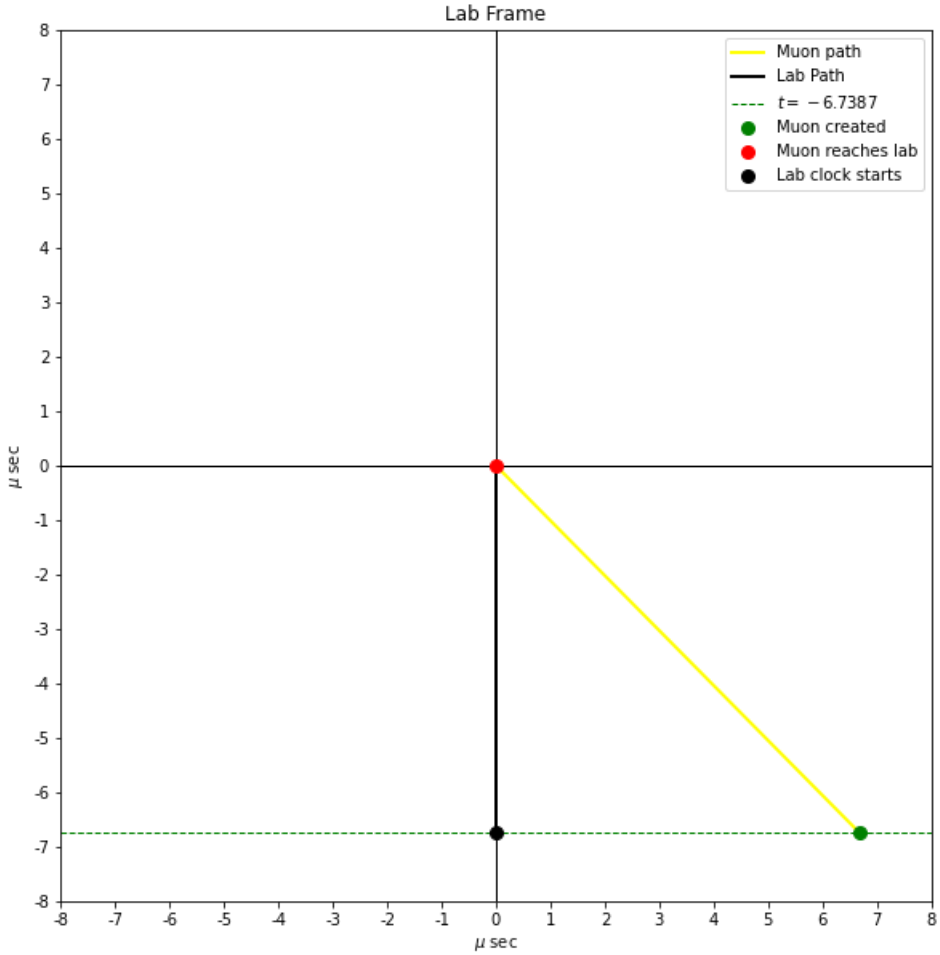
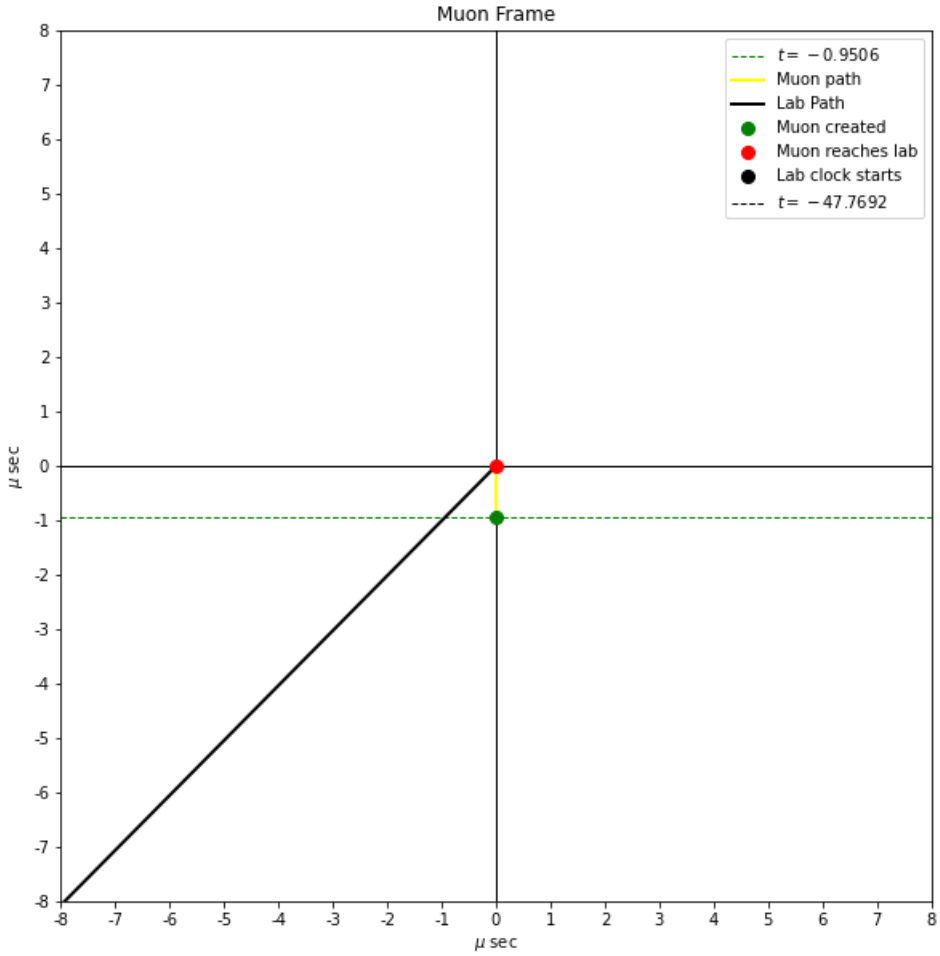
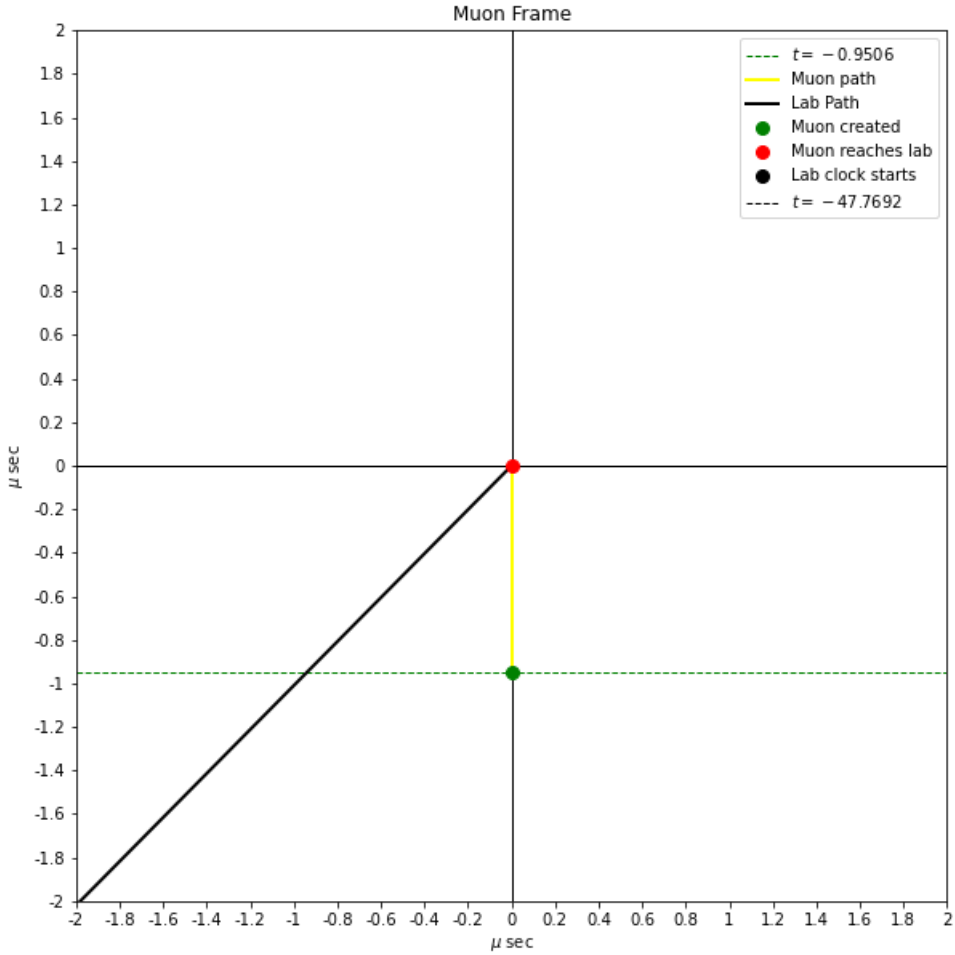
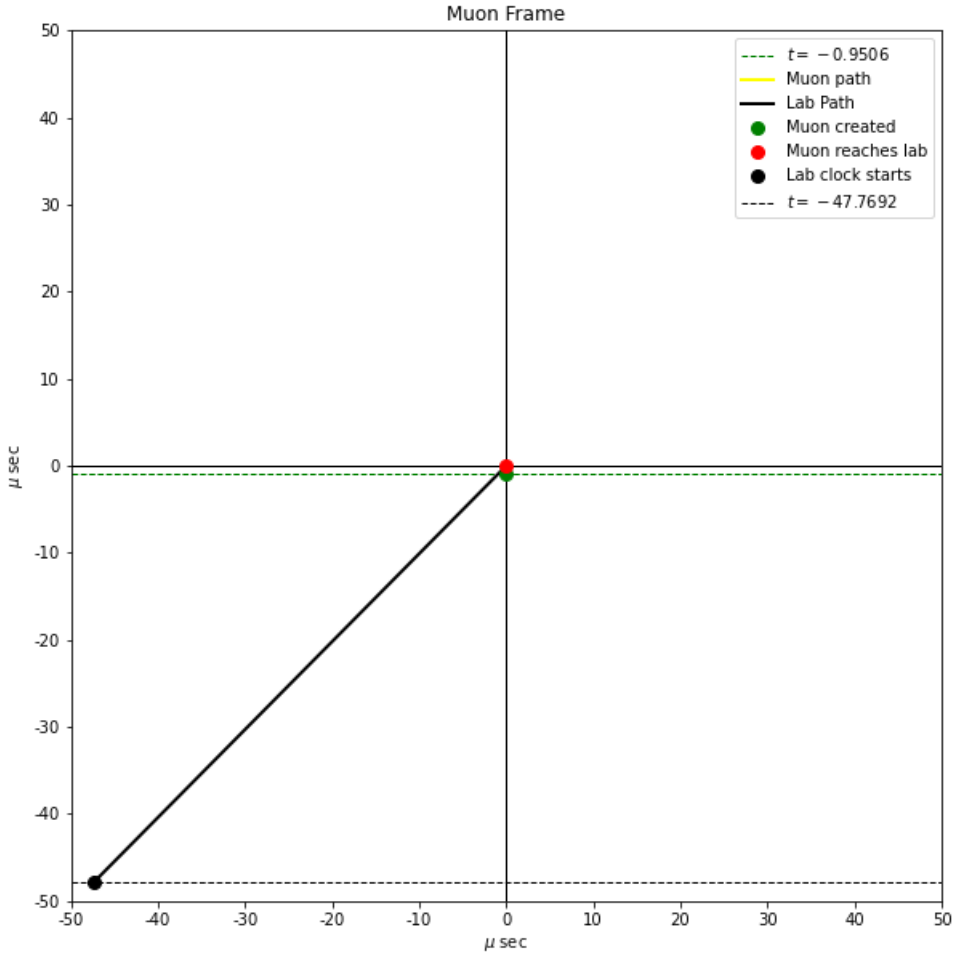
Problem 1


Lab Frame
Muon path
Lab Path
$t = -6.7387$
Muon created
Muon reaches lab
Lab clock starts
μ sec
μ sec


Muon Frame
t= −0.9506
Muon path
Lab Path
Muon created
Muon reaches lab
Lab clock starts
t= −47.7692
μ sec
μ sec


Muon Frame
$t = -0.9506$
Muon path
Lab Path
Muon created
Muon reaches lab
Lab clock starts
$t = -47.7692$
μ sec
μ sec



Calculation by "time dilation"

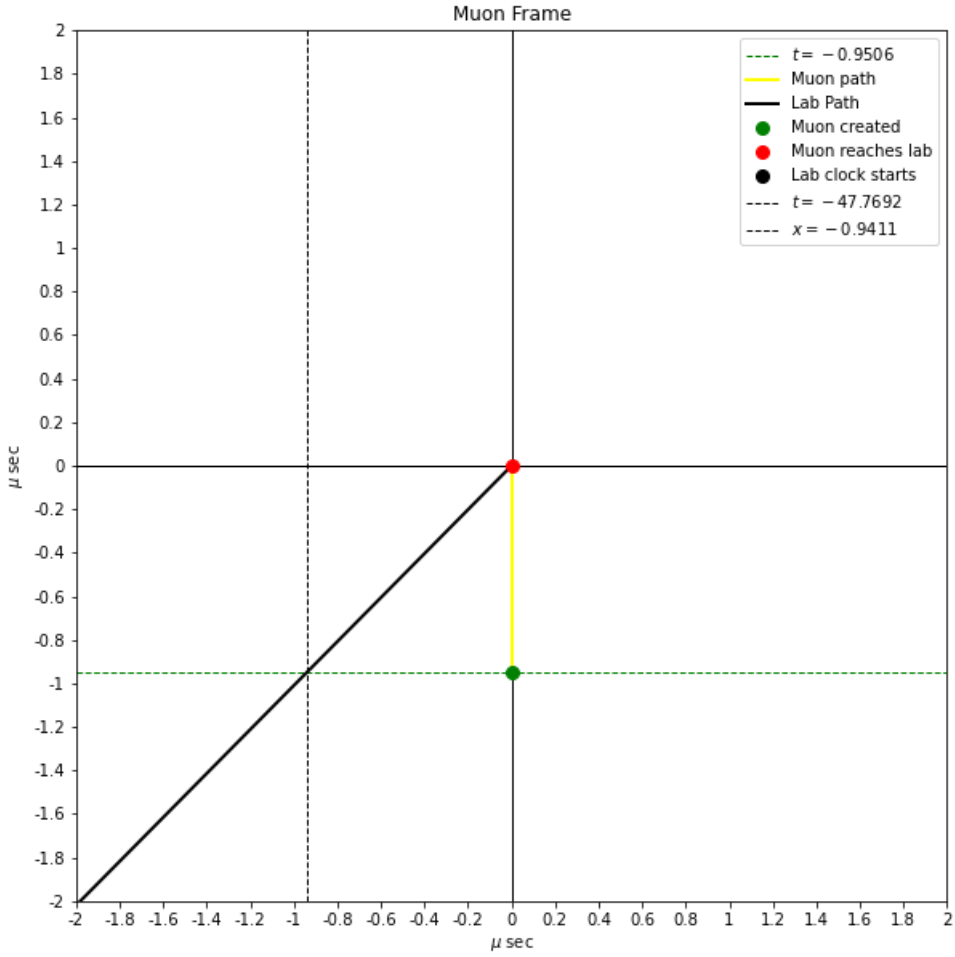
$\gamma \approx 7.089$

The muon's time is the proper time. So the lab's time will be greater.

So we *divide* the lab time of 6.734 by γ.

$6.734 / 7.089 \approx 0.95 \mu s$

Problem 2



Calculation by "length contraction"

$\gamma \approx 7.089$

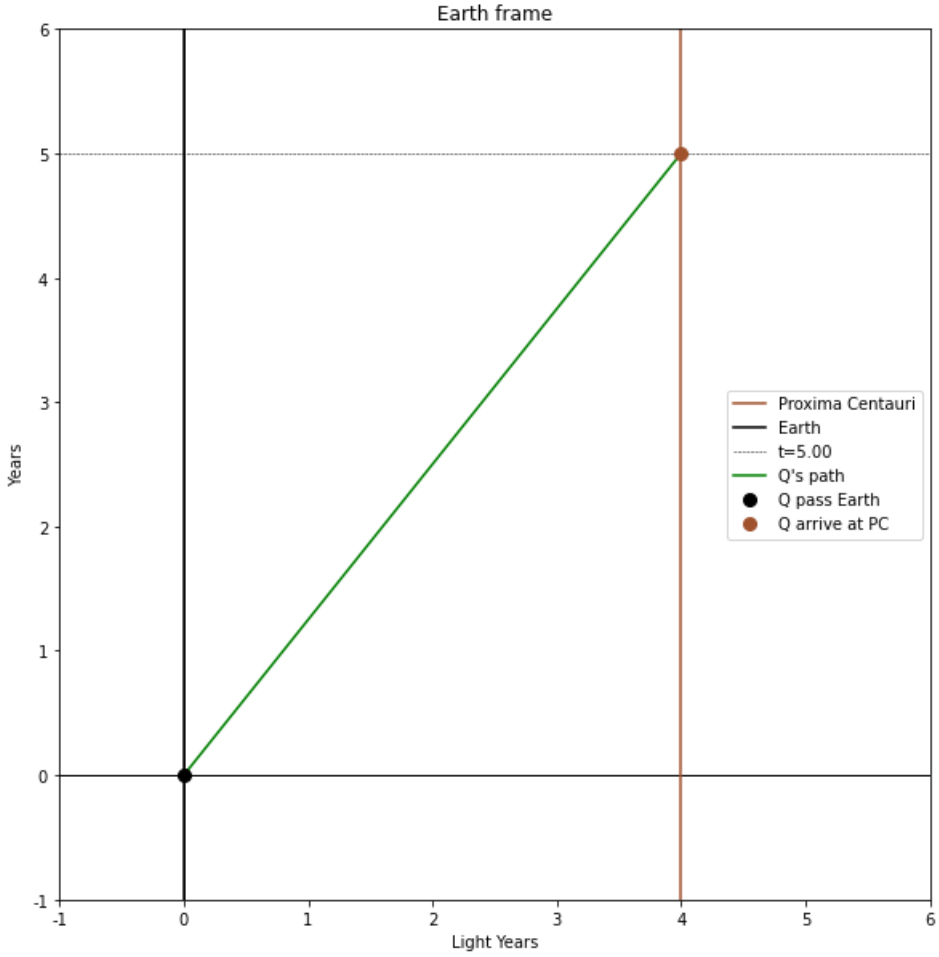
The labs's distance is the proper length. So the muon's distance will be less.

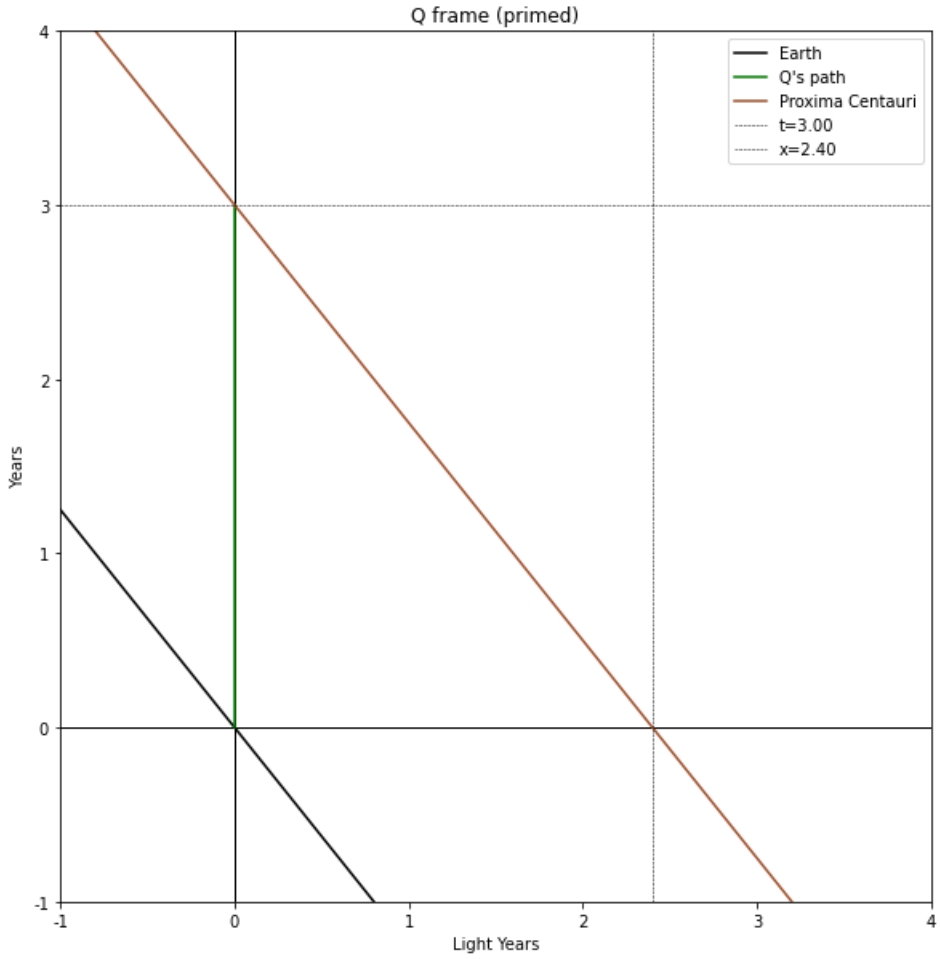
So we divide the lab distance of 6.671 by γ.

$6.671 / 7.089 \approx 0.94 \mu s$

Or $2,000 m / 7.089 \approx 282 m$

Problems 3, 4, 5


Earth frame
Years
Light Years
Proxima Centauri
Earth
t=5.00
Q's path
Q pass Earth
Q arrive at PC


Q frame (primed)
Earth
Q's path
Proxima Centauri
t=3.00
x=2.40
Years
Light Years
4
3
2
1
0
-1
-1
0
1
2
3
4