

2021 MAY 13

My Agenda

- Looking to the end of the term
 - Week 7 right now
 - No meeting during week 10?
 - ~2 more meetings?
- MTH 537 Update
- Project B
 - Wrap up? (For now?)
- Briefly Entertain Ch 3 Exercise 10?
- Chapter 4
 - Possibly wrap up by next meeting?

MTH 537 Update

Quick update:

The Reissner–Nordström metric, with its q^2 term; this q^2 is specific to the charge of the Black hole. The plots I did last time where I changed sign are invalid (and don't make sense upon further inspection).

It was also pointed out that charged particles don't move on geodesics: they accelerate due to Electrodynamics. Geodesics describe paths for objects that are not accelerating (where we don't count gravity as acceleration in this context).

Project B

Wrap up?

Section 8 looks like it could be worth revisiting after Chapters 4 and 5. Most of the rest of the content is essentially reinforcing the horizon and what it means physically, even for a rain frame. The longest path to the singularity involves starting at rest at the horizon (or as close as possible to at rest) and falling without trying to fire engines or accelerate.

Chapter 4

Circular orbits can only occur at two radii: $6M$ and $3M$. The $6M$ orbit is a stable equilibrium, where as the $3M$ orbit is unstable - any perturbation will cause either escape or decay. The $3M$ orbit also requires the angular momentum to infinity, and the measured local speed is 1 - only light can orbit circularly at this radius.

We again have a disagreement between the local measurement of speeds (shell observer) and the faraway measurement. Shell measures unity for light and bookkeeper finds the speed to depend on the r-coordinate. Using Eq 50 from Chapter 4 (4-30), the circular orbit where light would be measured to be at unity is at $r = M$.