

APM 426 / 1700
Assignment 9

Prof. McCann

Wald # 5.4, 5.5

1. Compute the perihelion precession per orbit and per year for Venus ($R = 1.1 \times 10^{11}m$, $T = 1.9 \times 10^7s$), Earth ($R = 1.5 \times 10^{11}m$, $T = 3.2 \times 10^7s$) and Mars ($R = 2.3 \times 10^{11}m$, $T = 5.9 \times 10^7s$) given their orbital period T and distance R from the sun.
2. Paul orbits a neutron star in a circular orbit at radial coordinate $r = 4M$. Peter has been fired radially from a cannon on the neutron star with less than escape velocity. He flies outward, passes Paul in his orbit, reaches a maximum radius, and fall back down just happening to meet Paul again. Between their two meetings Paul has completed 10 circular orbits of the neutron star. If they synchronized their watches at their first meeting, by how much do their watches disagree at the time of their second meeting?

NB: Written reports for independent projects are due on Quercus by midnight on Monday March 24.

Project presentations will take place 13h10-15h00 on both Tuesday April 1 and Thursday Apr 3 in our usual classrooms on those dates. Note this means starting an hour earlier than usual on Thursday, for all who can. Each presentation will be 8 minutes, plus a minute or two to answer questions while transitioning to the next speaker. Obviously, this is only enough time to briefly introduce and survey your topic, not to present details or mathematical arguments, so you will need to think carefully about what to include, and rehearse the timing with a classmate or friend. You may choose to do a (a) poster, (b) blackboard, or (c) laptop presentation. If you are doing a laptop presentation please email me the file at least a day in advance (in .pdf or other standard format; if you are using a format my MACbook does not support you will need to provide your own laptop). On the day of your presentation (before or after), please leave me with or send me a copy of your (a) poster or (b) notes, if you are doing a poster or blackboard presentation. Due to time constraints, I would recommend trying (c) a laptop presentation.