PHYS 331 — Problem Set #11

Reading: Taylor 9.1, 9.3–9.9; read pp. 330-333 of 9.2 and skim the rest of 9.2.

Problems to be handed in Friday 11/1:

1. Taylor 9.2
2. Taylor 9.8
3. Taylor 9.9
4. Taylor 9.10 (You can use Taylor's appoach, or something more like what I did in class.)
5. Taylor 9.24 (a)–(e), but you should use a computer to solve the euqtions of motion.. Make parametric plots of y vs. x from $t = 0$ to $t = 10$. Be sure to look at the short-time behavior, which is easy to do with the zoom feature of Jupyter graphs.
6. Taylor 9.26
7. Taylor 9.29 (Note that the g in the given answer is really g_{eff}.)
8. The equations of motion governing free-fall at the surface of the earth are given in Eqs. (9.52) and (9.53). Taylor derives a first-order approximation for the eastward deviation caused by the Coriolis given by Eq. (9.57).
   (a) Use your python code to find the solution for the motion of a mass dropped down a 100-meter-deep mine shaft, and compare your result graphically to that given by the first-order approximation.
   (b) Repeat part (a), but this time imagine that a day on earth lasts $24\,\text{hr}/1000$.