Accelerator Physics - Homework 7
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Exercise (Review)
Go through the notes that describe the simplified coordinate system for J and φ and lead to the single resonance Hamilton function. Write a successive list of the main steps and approximations taken to obtain at the single resonance approximation. When is this approximation a good model of a realistic accelerator?

Exercise (Single resonance approximation)
An accelerator with linear optical elements, i.e. dipoles and quadrupoles. Use first order perturbation theory in nonlinear forces Δf to find which resonances can occur in the Hamilton function:
(a) for a circular accelerator with one short sextupole that you approximate as a delta function.
(b) for a circular accelerator with one continuous and constant sextupole strength all around the ring.

Exercise(Review)
Go through the steps of finding a fixed point in the single resonance system. Start with the single resonance Hamiltonian and write a list of the main steps taken to obtain the fixed points and to determine their stability.

Exercise (Amplitude dependent tune shift)
Compute the horizontal tune distribution $\rho(\nu_x)$ for a Gaussian beam with an emittance of $\epsilon = 180$nm when the ring has the tune of $\nu = 0.52$ and there is an octupole of strength 2m^4 with length 1m at a place with β_x of 40m.

Exercise (Preparation for class)
Sleep well.