Exercises

Exercise 28.1 Spurious orbits under the Krein-Friedel-Lloyd contruction. *Draw examples for the three types of period orbits under the Krein-Friedel-Lloyd construction: (a) the genuine periodic orbits of the scattering region, (b) spurious periodic orbits which can be removed by the subtraction of the reference system, (c) spurious periodic orbits which cannot be removed by this subtraction. What is the role of the double limit* $\eta \to 0$*, container size* $b \to \infty$*?*

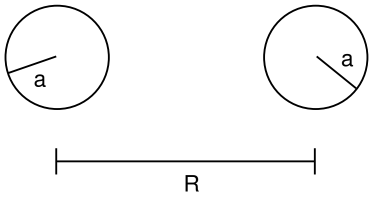
Exercise 28.2 The one-disk scattering wave function. *Derive the one-disk scattering wave function.*

(Andreas Wirzba)

Exercise 28.3 Quantum two-disk scattering. *Compute the quasiclassical spectral determinant*

$$Z(\varepsilon) = \prod_{p,j,l} \left(1 - \frac{t_p}{\Lambda_p^{j+2l}}\right)^{j+1}$$

for the two disk problem. Use the geometry



The full quantum mechanical version of this problem can be solved by finding the zeros in k *for the determinant of the matrix*

$$M_{m,n} = \delta_{m,n} + \frac{(-1)^n}{2} \frac{J_m(ka)}{H_n^{(1)}(ka)} \left(H_{m-n}^{(1)}(kR) + (-1)^n H_{m+n}^{(1)}(kR)\right) ,$$

where J_n *is the* n*th Bessel function and* $H_n^{(1)}$ *is the Hankel function of the first kind. Find the zeros of the determinant closest to the origin by solving* $\det M(k) = 0$*. (Hints: notice the structure* $M = I + A$ *to approximate the determinant; or read* Chaos **2**, *79 (1992))*

Exercise 28.4 Pinball topological index. *Upgrade your pinball simulator so that it computes the topological index for each orbit it finds.*