PHYS 401 Homework---Due November 3

Griffiths---Problems 2.31, 2.33, 2.39 (bound states only)

In addition consider the finite square well from $-a$ to a and depth V_o as considered in class and the book. Assume the parameters are such that the dimensionless combination $z_0 = \frac{a\sqrt{2mV_0}}{\hbar} >> 1$. In particular take $z_0 = 20$.

a. How many bound states are there? (Remember there are both even and odd solutions)

b. Use Mathematica or a similar program to find the bound state energies for the even states. To do this you need to solve a transcendental equation. You can do this in Mathematica using the FindRoot function. Note to do this you need an estimated value for each of the solutions as an initial input. You can get this graphically. You can express your answers in terms of the parameters of the problems and your numerical solutions for the allowed values of the variable z.

c. Compare your numerical solutions with the approximate expression we derived for $z_0 >> 1$. Why does the approximation work well only for the low lying states? (You should answer this question on both mathematical and physical grounds,)