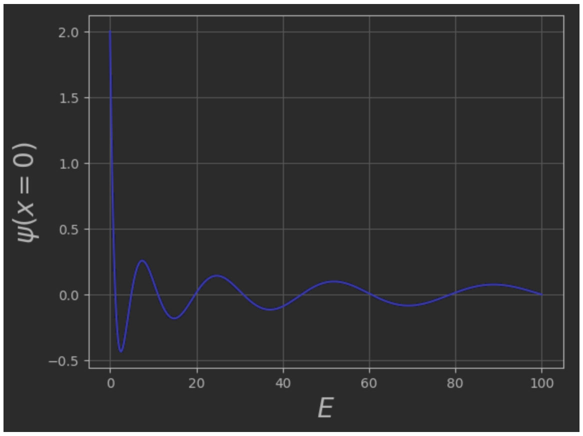
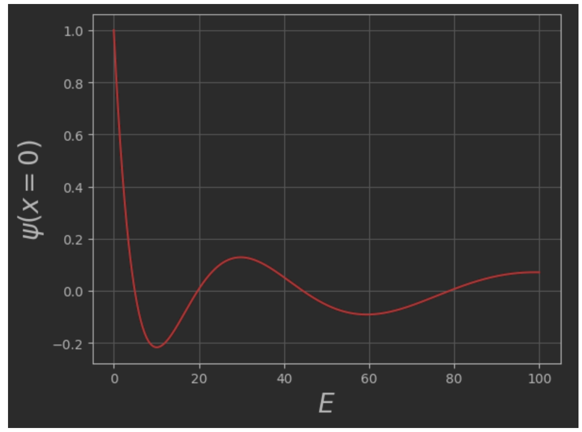
1)





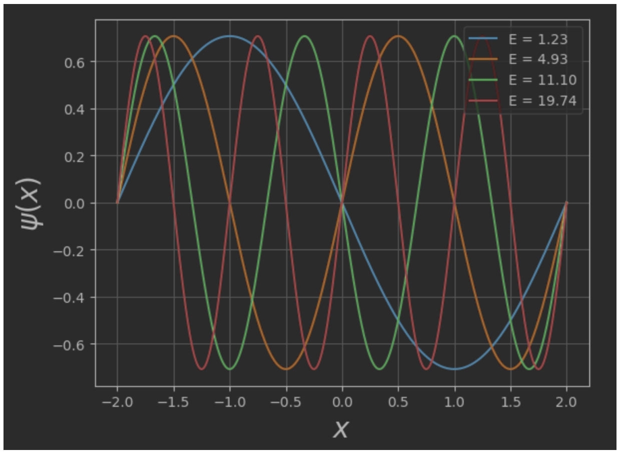
What happens when we double a? Well, Ψ(x) is scaled by a factor of 2 across the board, and it appears that the Ψ(x) is horizontally compressed by a factor of 4. (ie, 2^2)

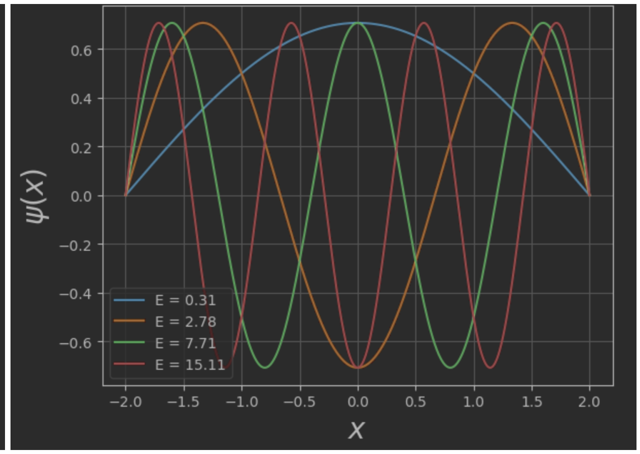
2)

Recall, the allowed energies of a particle in an infinite well are given by $E = \frac{\hbar^2\pi^2n^2}{2ma^2}$. Recall that we are using units where $\frac{\hbar^2}{m}$ = 1. So E = $\frac{\pi^2 n^2}{2a^2}$, and a = 2 (sorry, I forgot to switch it back to a = 1)

Energy levels predicted by shooting	Numerically calculated
1.2337006	1.23370055
4.9348024	4.934802201
11.1033051	11.10330495
19.7392093	19.7392088
30.8425142	30.84251375
44.4132187	44.4132198
60.4513239	60.45132696
78.9568328	78.95682521
99.929744	99.92974456

3)





Energies for even solutions (the calculated solutions give numbers that are very close to these, much like the chart above for even odd solutions)

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Energies for the bound states are:
  0.3084252
  2.7758264
  7.7106286
 15.1128322
 24.9824365
 37.3194425
 52.1238464
 69.3956554
 89.1348621
```

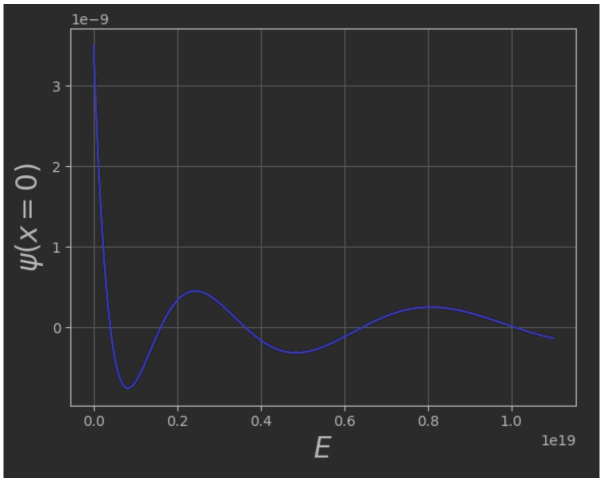
0.3084251375
2.775826238
7.7106238438
15.11283174
24.98243614
37.31944164
52.12384824
69.39565595
89.12486475

4)

If the chip is 7 nm, then *a* must be 3.5mm. Recall that $\frac{\hbar^2}{m}$ is set to 1, where *m* is the mass of the electron.

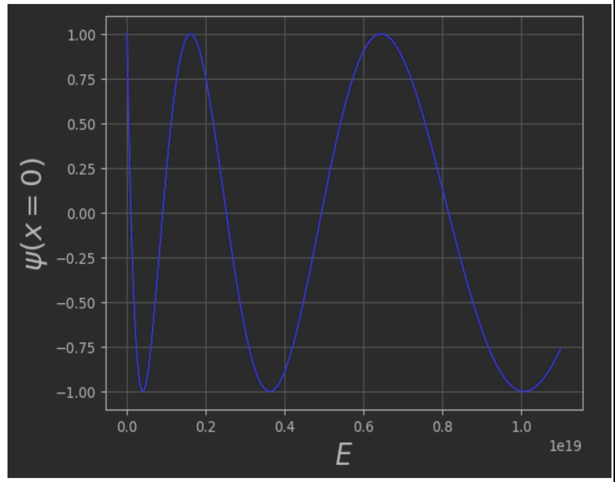
Then to calculate our energy levels, we need only sub in *a* = 3.5e-9 m and then multiply each of our calculations by $\frac{\hbar^2}{m}$, and then convert to eV.

Odd Solutions



Shooting Method	In eV	Calculated
402841041240758080	0.03077 eV	0.03077 eV
1611364027805915648	0.12308 eV	0.12308 eV
3625568910838534656	0.27693 eV	0.27693 eV
6445455634638121984	0.49232 eV	0.49232 eV
10071024298587344896	0.76926 eV	0.76926 eV

Even Solutions



Shooting Method	In eV	Calculated
100710375668287136	0.00769 eV	0.00769 eV
906392303217097088	0.06923 eV	0.06923 eV
2517756229349429248	0.19231 eV	0.19231 eV
4934802065603139584	0.37694 GeV	0.37694 GeV
8157529740936124416	0.62310 GeV	0.62310 GeV

They are precisely the same!!

5) **Now we have 'fun.'**

The first two energies are 10.3301867, 29.7239682 (in $\frac{\hbar^2}{m} = 1$ units)

For E = 10.33, the particle is most likely to be found in either the center of the well and x = +-⅔.

For E = 29.72, the particle is most likely to be found in the middle +- ⅖ and +- ⅘.

These are the most probable locations because Ψ reaches a local maximum or minimum at those points.