Square well ground state (Weinberg problem 1.1)

Define the ground state wavefunction in a square well from [-a,a]. Check it's norm. (Every command is executed in *Mathematica* using 'Shift Return 'after it's typed properly. To input ψ in *Mathematica,* type 'esc y esc')

```
ψ0[x_] = ...
Integrate[ψ0[x] ψ0[x], {x, -a, a}]
```

Define the trial wavefunction, up to a constant normalization factor. The underbar _ makes x a variable.

```
ψ[x_] = norm (a^2 - ...)
```

Norm is defined to make the wavefunction normalized

```
ShouldBeOne = Integrate[ ..., {x, -a, a}]
```

Find solutions for norm. (We clear first to avoid problems when you accidentally re-run the command.)

In[7]:=
```
Clear[norm]
sols = Solve[ShouldBeOne == 1, norm]
```

Select positive one

In[11]:=
```
norm = norm /. sols[[2]]
```

Plot ψ and ψ0 for a=3

In[14]:=
```
Plot[{ψ[x] /. a → 3, ψ0[x] /. a → 3}, {x, -3, 3}]
```

Find the probability that ψ is in the ground state by calculating the overlap of the two wavefunctions. Numerical evaluation of 'blah 'can be done by N[blah] or by blah // N.

```
Overlap = Integrate[ ..., {x, -a, a}]
ProbGroundState = ... // N
```