PROFESSOR: Now let me conclude for a few minutes by introducing the idea of how we're going to perturb things. So how are we going to set up our perturbation theory?

So for a perturbation theory we will do the following. We will take our system and introduce again-- so setting up the perturbation expansion. So we want to give you just an idea of what we're going to do. So H of t is going to be H of 0 plus delta of H of t. And now your lambda is going to be treated as small.

So again, we're going to use a power series expansion, and everything is going to depend on lambda. And we're going to think coefficients in that way. We're going to work with the state psi tilde. You remember, if you know psi tilde, you put an e to the minus ih 0t over H bar and you can get H. So we'll set the perturbation for psi tilde.

And it will have a zeroth part that is time dependent plus a first part that is time dependent. Every term is going to be time dependent in the perturbation. And what was our Schroedinger equation? Our Schroedinger equation was ih bar d dt of psi tilde of t was delta H, like that, times psi of t.

But we need to change things a little bit. We replace delta H by lambda delta H. So now it's going to have a lambda here. So I now need to plug in this thing, which is not going to be too difficult. It's easier than what we did in time independent perturbation theory.

d dt of psi 0-- let me not put the time dependence in the case psi 1 lambda square psi 2. And this is equal to lambda delta H bar psi tilde again. So it's psi 0 plus psi 1 plus those terms.

So for here we'll just read the first few terms. They're pretty easy. There's not much of a lambda thing there. So what do we get? Terms without lambda. ih bar d dt of psi tilde 0 of t equals 0. This is lambda to the 0. That's the only term without the lambda, the one that arises here.

Terms without lambda already. Well, there's one term here, which is Schroedinger-like. d dt of psi 1 is, in fact, equal to order of lambda. You have delta H tilde psi 0 of t.

And the next one, ih bar d dt of psi 2 of t-- that's lambda squared-- comes from the derivative acting here. We have to look for lambda squared here. And I forgot this lambda. And therefore, this time you get delta H psi 1 of t.

In general, for lambda n, you will get ih bar d dt of psi n-- I'll actually put n plus 1, n plus 1 here-- is given by delta H acting on the previous one. So this will be simple. Once you know psi 0, which is a constant, you put it here. This will be easily solved as an integral.

Once you have psi 1, you put it here. You easily solve psi 2 and start solving one after another. The fun thing is that you can write these equations explicitly. And just even the first order result, and sometimes the second, give you all the physics you want, which we will explore in the next few lectures.