6.2 For $k \to (1+\epsilon)k$ $\hat{H} = \hat{H}_0 + H' = \frac{1}{2}(1+\epsilon)kx^2$

6.3 $\psi(x_1,x_2) = \frac{1}{\sqrt{2}}\left(\psi_a(x_1)\psi_b(x_2) + \psi_b(x_2)\psi_a(x_1)\right) \to$ Boson

Ex $\psi_n(x) = \sqrt{\frac{2}{a}}\,\text{SIN}\left(\frac{n\pi x}{a}\right)$

$n = 1, 2$ $\psi(x_1,x_2) = \frac{1}{\sqrt{2}}\left(\frac{2}{a}\text{SIN}\left(\frac{\pi x_1}{a}\right)\text{SIN}\left(2\frac{\pi x_2}{a}\right) + \frac{2}{a}\text{SIN}\left(\frac{2\pi x_1}{a}\right)\text{SIN}\left(\frac{\pi x_2}{a}\right)\right)$

$$= \frac{\sqrt{2}}{a}\left(\text{SIN}\left(\frac{\pi x_1}{a}\right)\text{SIN}\left(2\frac{\pi x_2}{a}\right) + \text{SIN}\left(\frac{2\pi x_1}{a}\right)\text{SIN}\left(\frac{\pi x_2}{a}\right)\right)$$

Integrals run over each variable seperately

$$\iint \psi(x_1 x_2)\,dx_1\,dx_2 = \frac{1}{\sqrt{2}}\int \psi_a(x_1)\,dx_1 \int \psi_b(x_2)\,dx_2 + \frac{1}{\sqrt{2}}\int \psi_b(x_1)\,dx_1 \int \psi_a(x_2)\,dx_2$$

dx_1, x_1 dummy variables

dx_2, x_2

For $\delta(x_1 - x_2)$ integral over dx_1 changes all x_1 to x_2

6.4 $E_n^0 = \frac{\pi^2\hbar^2}{2ma^2}n^2$, look at cases where m odd n even, n odd and m even