A particle in the harmonic oscillator potential has the initial wave function

$$\Psi(x,0) = A[u_0(x) + u_1(x)]$$

for some constant, A.

(a) Normalize $u_0(x)$.
(b) Use the raising operator to get $u_1(x)$.
(c) Normalize $\Psi(x,0)$.
(d) Find $\Psi(x,t)$ and $|\Psi(x,t)|^2$
(e) Find the expectation value of x as a function of time. Notice that it oscillates sinusoidally. What is the amplitude of oscillation? What is the (angular) frequency?
(f) Use your result in (e) to determine $\langle p\rangle$. Check that Ehrenfast's equation,

$$d\langle p\rangle/dt = -\langle dV/dx\rangle,$$

holds for this wave function.
(g) Graph/animate $|\Psi(x,t)|^2$ from t = 0 to t = $(4\pi/\omega)$ using Maple. You can use the one for the double well as a template.