1) Zettilli Exercise 1-5.

2) Use the ideas and assumptions of the Bohr model (circular orbits with $F = ma$ and angular momentum $L = n\hbar$) to find the possible energies of a particle of mass $m$ subject to a linear restoring force $\vec{F} = -kr\hat{r}$, and $V(r) = \frac{1}{2}kr^2$.

3) Zettilli Exercise 1-6.

4) According to classical physics, an electron orbiting a nucleus at frequency $f$ will emit electromagnetic waves with frequency $\nu = f$. In the Bohr model, a hydrogen atom can emit photons with frequencies given by $h\nu = E_n - E_m$. Show that in the limit of large $n$, the frequency for photons from the transition from state $n + 1$ to state $n$ matches the orbital frequency for those states, in agreement with the classical expectation.

5) Zettilli Exercise 1-33.

6) Zettilli Exercise 1-38.

7) For a relativistic particle, the energy and momentum of a particle of mass $m$ are related by $E^2 = (pc)^2 + (mc^2)^2$. Using the deBroglie relations, $E = \hbar\omega$ and $p = \hbar k$ find an expression for $\omega(k)$. Then show that $\frac{d\omega}{dk}$ is equal to the velocity of the particle. Remember that $E = \gamma mc^2$ and $p = \gamma mv$. 