

PHY 344 – Problem Set #4

1. The derivation of the Fermi Golden Rule depends of the frequency and time dependence of a function of the form:

$$F(\omega_{n0}, \omega, t) \equiv \left| \frac{e^{i(\omega_{n0} + \omega)t} - 1}{\omega_{n0} + \omega} + \frac{e^{i(\omega_{n0} - \omega)t} - 1}{\omega_{n0} - \omega} \right|^2, \quad (1)$$

where $\omega_{n0} \equiv (E_n - E_0)/\hbar$. Use Maple to plot $F(\omega_{n0}, \omega, t)$ in various ways to help you understand in what sense the approximation

$$F(\omega_{n0}, \omega, t) \approx 2\pi t (\delta(\omega_{n0} + \omega) + \delta(\omega_{n0} - \omega)) \quad (2)$$

is valid.