

1. Jackson 9.3
2. Jackson 14.9 [only (a) and (c) and consider only the non-relativistic limit]
3. Consider an infinite plane of charge per unit area  $\sigma$  located at  $z = 0$ . The sheet oscillates along the  $x$  direction with a displacement  $\Delta x = d e^{-i\omega t}$ .
  - (a) Calculate the electric field from the charged sheet when  $d = 0$ .
  - (b) Sketch the electric field when  $d \neq 0$ . Indicate the direction of the magnetic field. What is the direction of the Poynting vector? How do  $E$  and  $B$  fall off with distance  $|z|$  from the charged sheet?
  - (c) Starting from Maxwell's equations, derive a differential equation for the time varying electric and/or magnetic field.
  - (d) Solve the differential equation for the time varying electric and magnetic fields and the Poynting flux.
  - (e) The sheet now oscillates in the  $z$  direction rather than the  $x$  direction. Indicate how the previous results would change.