Homework Assignment 3 **grading key** **assigned September 7**

Reading Assignment
Chapter 9 Sections 1 ~ 4

Problems Assignment - ***due date is Friday September 14***
Instructions:
* Neatness counts; lack of neatness counts negatively.
* Start each problem solution on a new page of paper.

Problem 3-1 [5 points; 1 1 1 1 1]
Concerning an electromagnetic plane wave in vacuum ...
(A) Draw the familiar picture of an electromagnetic wave.
(B) Calculate the energy densities u_E and u_B, and the energy flux density **S**. Verify that energy is locally conserved.
(C) The spectrum of classical waves is infinite; list 7 parts of the EM spectrum.
(D) State the superposition principle.
(E) Explain this statement: The e.m. plane waves (in vacuum) are "complete".

Problem 3-2 [4 points; 2 2]
Concerning an electromagnetic plane wave in vacuum ...
(a) Prove phase velocity = \omega / k .
(b) Prove phase velocity = c .

Problem 3-3 [4 points; 2 2]
Exercise 1.4.2

Problem 3-4 [4 points]
Exercise 5.4.3

Problem 3-5 [6 points; 2 2 2]
Exercise 9.1.1

Problem 3-6 [4 points; 2 2]
Exercise 9.1.3

Problem 3-7 [6 points; 2 0 2 2]
An electromagnetic plane wave with frequency ω is incident ***normally*** on a planar interface between two continuous media. Ignore magnetic susceptibility; that is, $\mu_I = \mu_T = 1$.
(A) Calculate the amplitude ratios E_0'/E_0 and E_0''/E_0. Express the answers in terms of the indices of refraction, n_I and n_T.
(B) Compare the results of (A) for TE polarization and TM polarization.
(C) Plot a graph of the two ratios as a function of n_T assuming $n_I = 1$.
(D) Plot a graph of the two ratios as a function of n_I assuming $n_T = 1$.

5 + 4 + 4 + 4 + 6 + 4 + 6 = 33