**HOMEWORK #1**
**Due at the start of Class on Thursday 10/11/07**

*Homework policy:* Late homeworks will be marked down by 20% per day. If you know that you need to turn in a homework late because of an emergency or academic travel, please let the TA know ahead of time. Collaboration is encouraged on homework assignments, however, the homework that you submit should reflect your own understanding of the material.

**Readings:**
Chapters 4 and 5 in the textbook.

**Problems:**

1.  Use basic geometry to derive the following:
    a) Depth dependent magnification relation (Equation 5.13)
    b) Source magnification relation (equation 5.20).
2.  Problem 5.2
3.  Problem 5.6
4.  Problem 5.12 part a.
5.  Problem 5.17
6.  Problem 5.18 (a-d)
7.  Problem 5.19

**Matlab Exercise:**

We will be using MATLAB throughout the course. The purpose of this exercise is to familiarize you with some of the MATLAB commands used to displaying and manipulating images.

1.  Use the MATLAB command *zeros* to create a 128x128 matrix of zeros.
2.  Now fill in your matrix with 1's in the appropriate positions to create a cross pattern similar to that shown at the end of Tuesday's lecture.
3.  Use the *imagesc* function to look at your image. Play around with the *colorbar* and *colormap* functions to see what these do. To find out how to use a function, just type help function-name (e.g. *help imagesc*).
4.  Now define a 9x9 matrix that is a Gaussian function of the form
    $\exp\left(-((x-x_0)^2 + (y-y_0)^2)/w\right)$ where $x_0$ and $y_0$ denote the center of the matrix and $w$ is a width parameter. Play around with different values of $w$ and see what the resulting images look like.
5.  Pick a value of $w$ that will create some noticeable blurring. Use the *conv2* command to convolve your cross image with the Gaussian. Experiment with different values of $w$.
6.  Turn in images of the cross image you created in part 2 convolved with Gaussians of different widths. Also, turn in a copy of your code.