

**Homework #3**

Due Date: Feb. 5, 2002

1. [10 each] Lim, Problems 3.2, 3.8, 3.11, 3.16
2. [100] In the problem you will write a 2D DCT programs using Matlab's `fft2` and `ifft2`. Matlab has its own `dct2`, but you will write your own – the Matlab `dct2` is slightly different that which we discussed in class so you can't use it exactly to debug your code. You will also look at the ability of the DCT and DFT
  - a. Write the forward `dct_2` function using `dct_2_template.m`.
  - b. Write the forward `idct_2` function using `idct_2_template.m`.
  - c. Run the first half of `hw3_template.m` to validate the forward and reverse 2D DCT's that you wrote. This part produces 4 images. Please label all images.
  - d. Now, we will look at that information compression properties of the DCT.
    - i. Break the image into 6 128x128 subimages (blocks).
    - ii. Execute the 2D DCT on each block.
    - iii. Retain a 32x32 block of data from the DCT of each, specifically let:
$$C_x(k,l) = \begin{cases} C_x(k,l) & k \leq 31, l \leq 31 \\ 0 & \text{otherwise} \end{cases}$$
    - iv. Inverse 2D DCT each block and piece image together again.
  - e. Do the same steps for the DFT. For part iii., keep an equivalent number of independent coefficients (note that DFT is complex, DCT is real).
  - f. Compare the results for d. and e. Is DCT or DFT preferred for block processing of data? Hand in code and all figures.