

Homework 2:

Mathematics of Visualization Module in MA 325

1. Consider the DFT with $n = 4$.
 - (a). Use the Euler formula to find z , z^2 , z^3 and the 4×4 matrix \mathbf{F} .
 - (b). By hand compute the DFT of $f = [8 \ 6 \ 3 \ 1]$.
Confirm your computations by using the Matlab command `fft(f)`.
2. Consider the convolution identity $\mathbf{F} \text{conv}(a,b) = \mathbf{F}A .* \mathbf{F}B$ where $n = 4$.
 - (a). By hand compute $\text{conv}(a,b)$ where $a = [1 \ 3 \ 7 \ 2]$ and $b = [8 \ 6 \ 3 \ 1]$.
 - (b). Use Matlab to verify the convolution identity.
3. Consider the Matlab code `fftsine2d.m`
 - (a). Modify this code to replace the old noise with the new noise
$$30(1 + \sin(2\pi x / 70)) + 15(1 + \cos(2\pi y / 70)).$$
Execute the code using $d0 = 150$.
 - (b). Execute the code using $d0 = 130$.
Why does this filter the above noise?
4. Consider one of the filters in Lecture 8.
 - (a). Verify (duplicate) the calculations.
 - (b). Experiment with the parameters of that filter.
 - (c). Apply this filter to another image.