1. Find the Fourier series for the following continuous time function, periodic with period 2π seconds:

$$f(t) = \begin{cases} 1 & 0 < t < \alpha \\ 0 & \alpha < t < 2\pi \end{cases}$$

2. Describe the steps in your algorithm to sort a deck of cards quickly, using a maximum of 16 people. You may not assume that any of your people are card sharks.

3. Recall that the decimation-in-time procedure for the DFT reduces the N point DFT to the merging of two $N/2$ point DFTs. Said somewhat differently, if $N = 2^p$, the DFT matrix F may be factored as a product of $p = \log_2 N$ matrices, each of which has only two nonzero entries in each row, and one of these is a 1. Carefully count the number of multiplications and additions in each method of computing the DFT. What is the improvement factor if $N = 2048$?

4. What is the ordering of $x_0, x_1, \ldots, x_{15}$ if the indices are placed in bit reversed order?