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HOMEWORK SET #6

Note: Please show all the steps leading to the final answer.

1. Consider the three-element array depicted below where the spacing between the elements is $d = \lambda/4$. Assume that $I_1 = j$, $I_2 = 1$ and $I_3 = -j$.

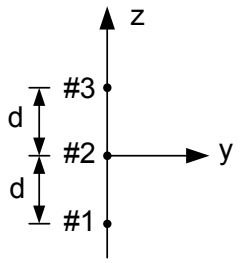

Figure 1: Geometry of the three-element array in Problem 1

   (a) Find the normalized array factor.

   (b) Find all the nulls for $0 < \theta \leq \pi$.

2. Repeat the previous problem, i.e., both part (a) and (b) of problem 1, for the case where $I_1 = j$, $I_2 = 2$ and $I_3 = -j$. Also compare the patterns of both arrays in problem 1 and 2.

3. Four isotropic sources are placed along the z-axis as shown below. Assuming that the amplitudes of the elements #3 and #4 are 1, and those of the elements #1 and #2 are -1, and $d = \lambda/2$, find

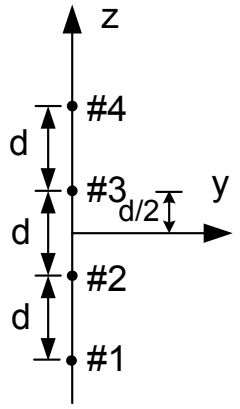

Figure 2: Geometry of the 4-element array in Problem 1

   (a) the array factor (also simplify your answer)

   (b) all the nulls