Cardioid Challenge Questions

1. Describe the pattern that happens at the bottom of the image. Specifically, what happens at the vertices nearest n/2?

2. Explain why sometimes there is a line from top to bottom but not at other times.

3. Explain why, when k = 2, n-1 maps to n-2.

4. Explain the $n = k^2$-1, k image. In particular, why do 0, k+1, 2k+2, etc., all have empty spaces rather than one or more lines in and out?

FACT: The image when n = 6 and k =2 has a square U with a vertical line in the middle like this:

5. For what other values of n do these same lines reappear (as part of the complete image)?

6. Suppose n is a multiple of 3, n = 3j and k = 2. Verify that the BOTTOM of the cardioid envelope curve is ¾ of the way down the entire image. **HINT**: What are the coordinates of vertex j and 2j in this instance?