POLAR COORDINATES - INTERESTING GRAPHS, PART 2

COSMIN ROMAN

Here we have graphs of the form $r = a + b\sin(\theta)$. The important (and interesting) issue here is not how big a and b are, but rather how big they are with respect to each other. The first three pictures will depict the cases:

- $a < b$ - two loops, one inside the other
- $a = b$ - the cardioid ... looks like a circle, but has a sharp point pointed inwards
- $a > b$ - again some kind of a cardioid, but the sharp point becomes smoother

These you should remember (especially the second and the third - those two are in your textbook)

Nevertheless, there are nuances ... so the following pictures will depict a gradual change:

- a very small with respect to b - you will see two loops, one inside the other; the bigger the difference, the closer the loops
- a getting close to b - one of the loops gets real small
- $a = b$
- a becomes a bit bigger
- a is way bigger

Again, the cosine versions of these graphs are nothing but those graphs rotated 90 degrees counterclockwise.

(go to next page - the pictures are pretty big, they are one per page)

Date: 12/03/2001.

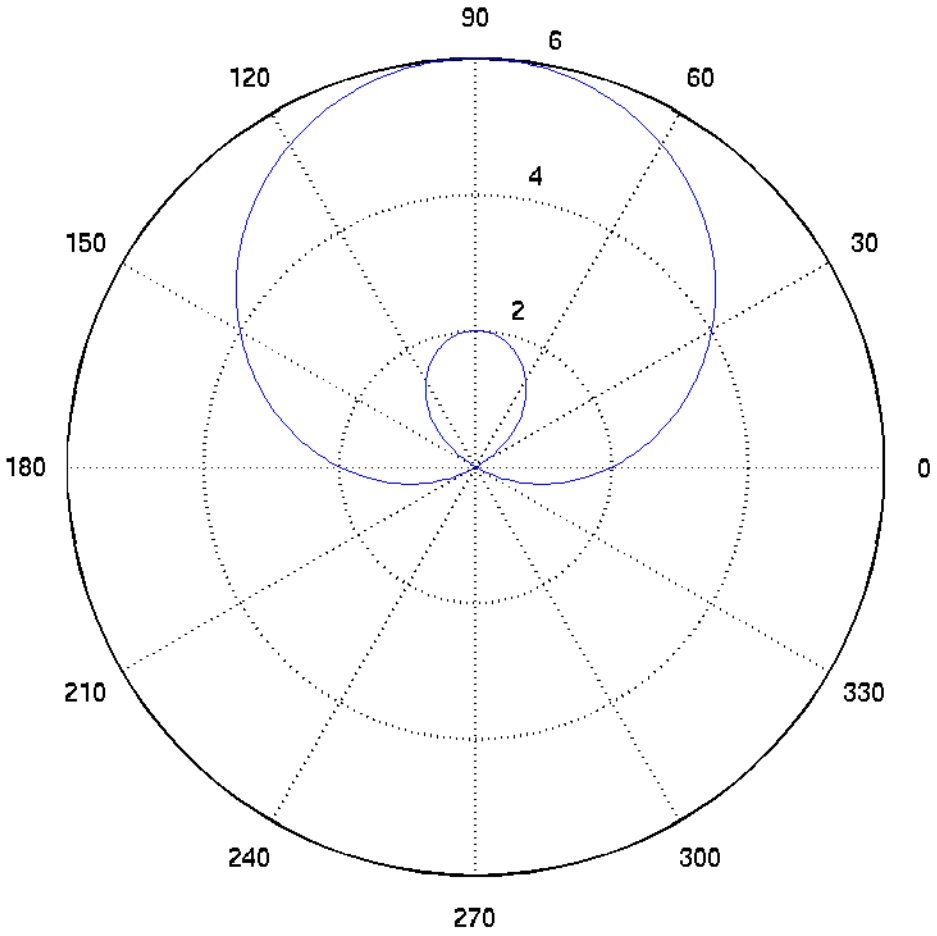

FIGURE 1. $r = 2 + 4\sin(a)$ - two loops

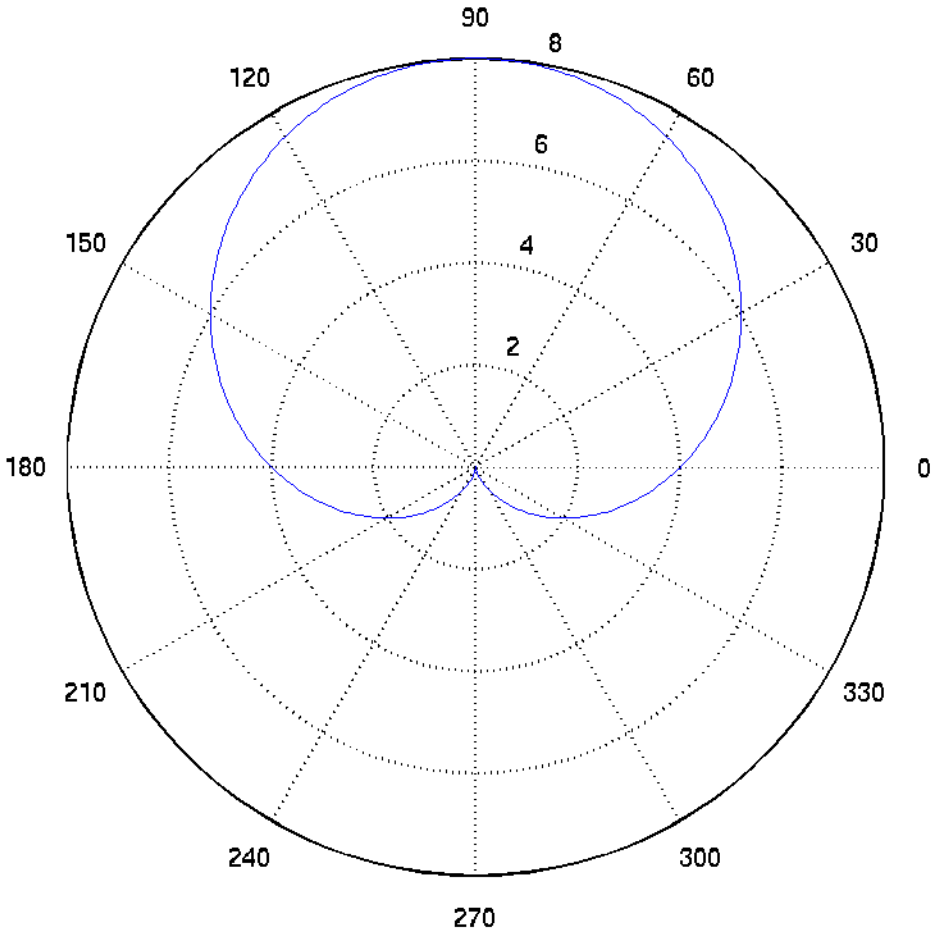

FIGURE 2. $r = 4 + 4\sin(2a)$ - the classical heart shape: the cardioid

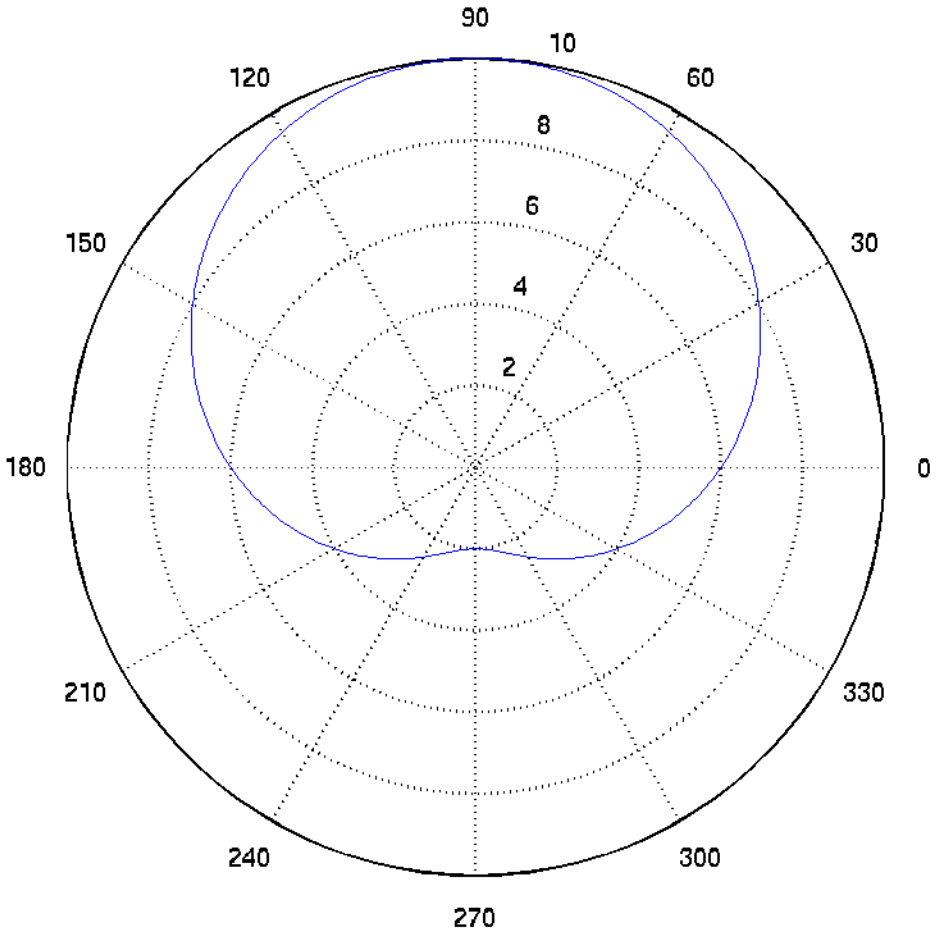

FIGURE 3. $r = 6 + 4\sin(a)$ - the sharp point is smoother now

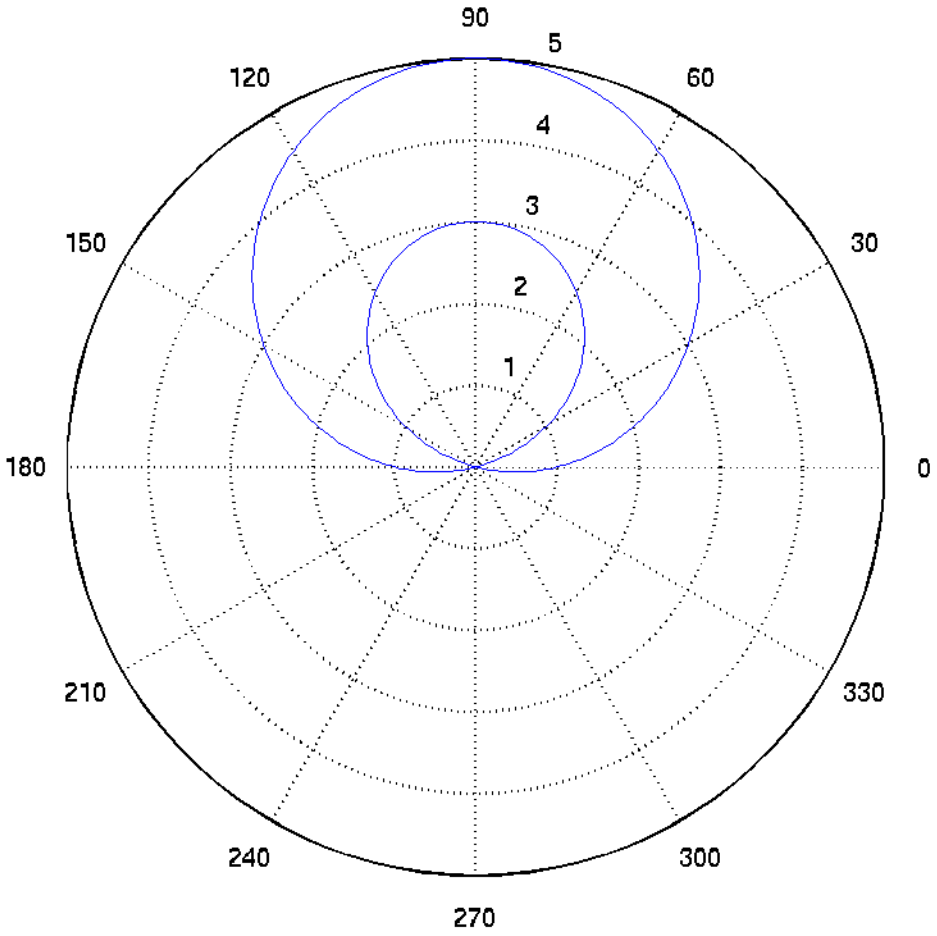

FIGURE 4. $r = 1 + 4\sin(a)$ - the loops are almost the same size

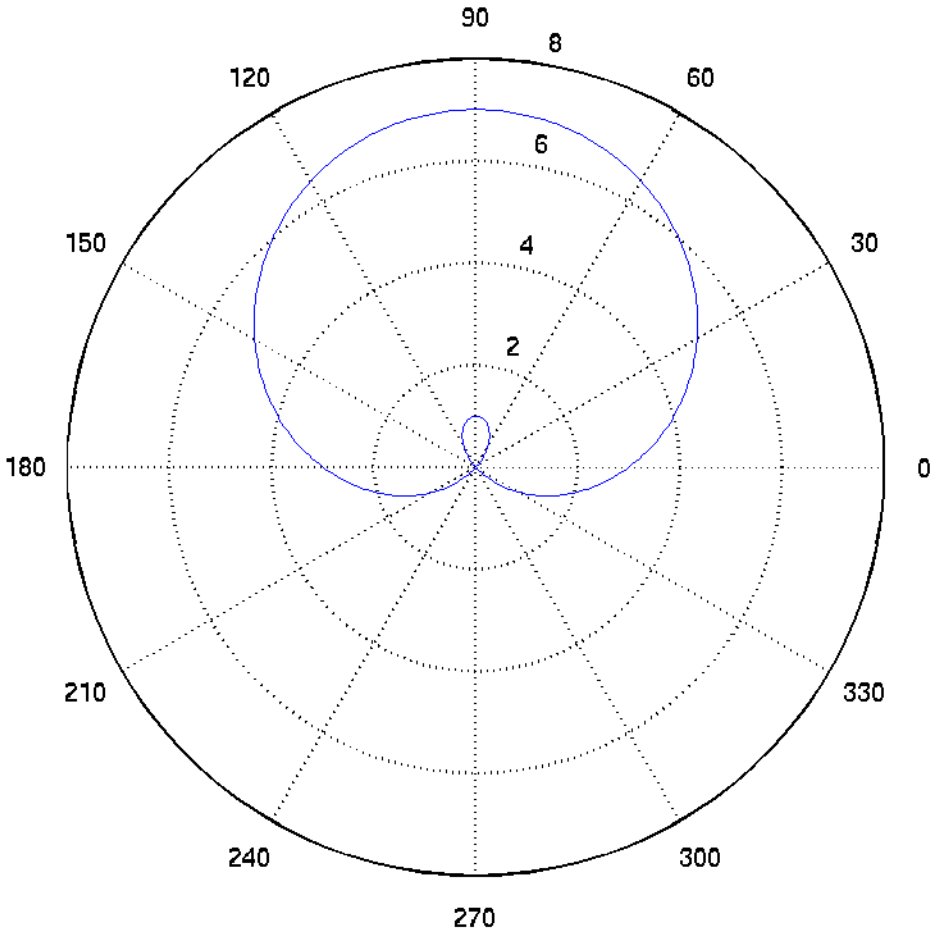

FIGURE 5. $r = 3 + 4\sin(a)$ - very small inner loop

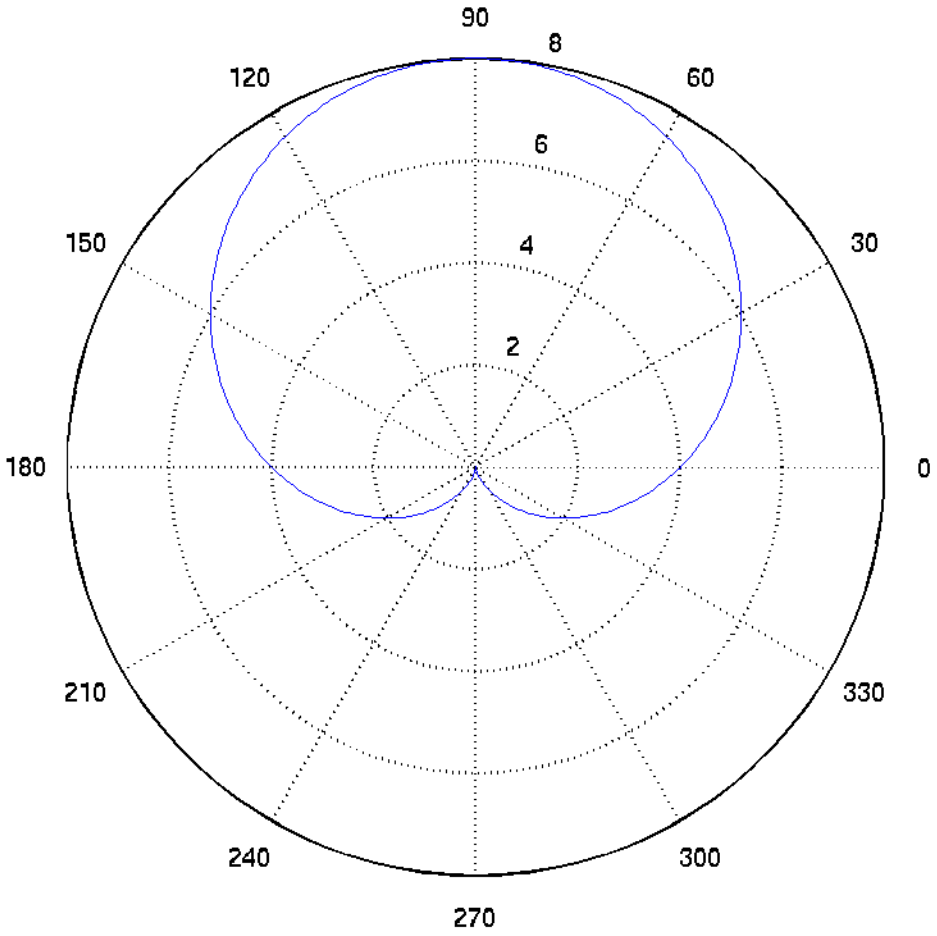

FIGURE 6. $r = 4 + 4\sin(a)$ - again, the equality case, for the cardioid

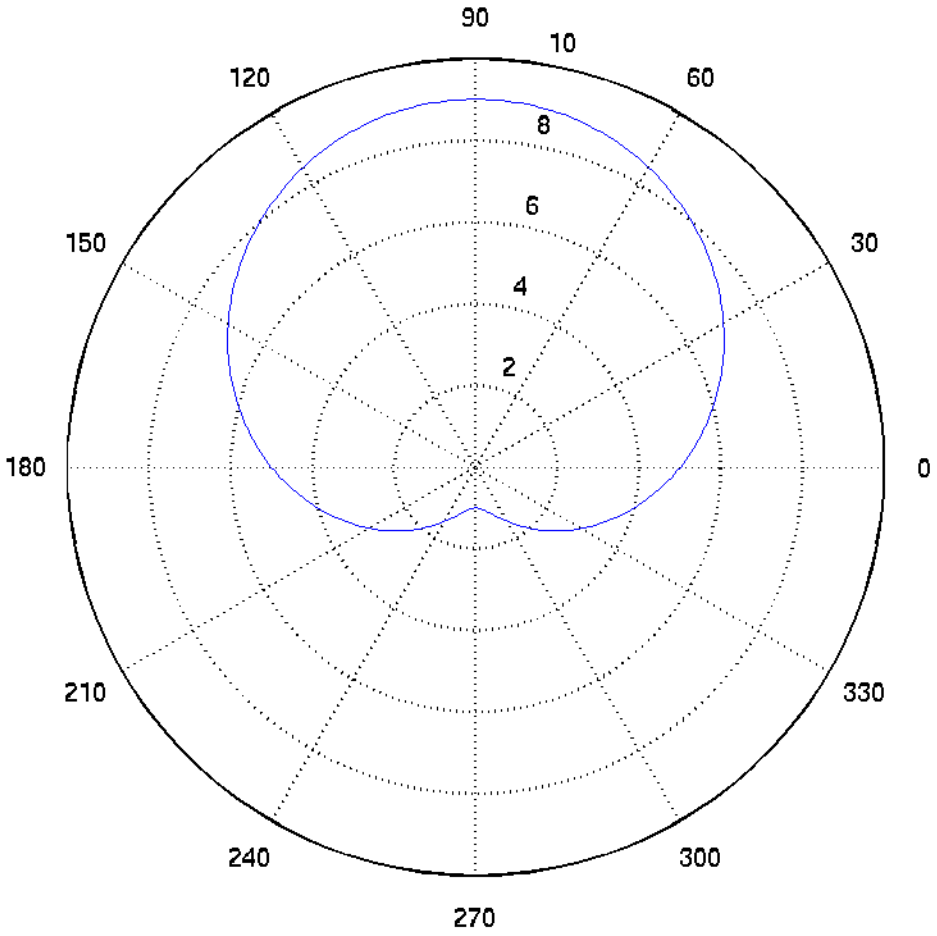

FIGURE 7. $r = 5 + 4\sin(a)$ - no more inner loop, but the sharp point gets smoother

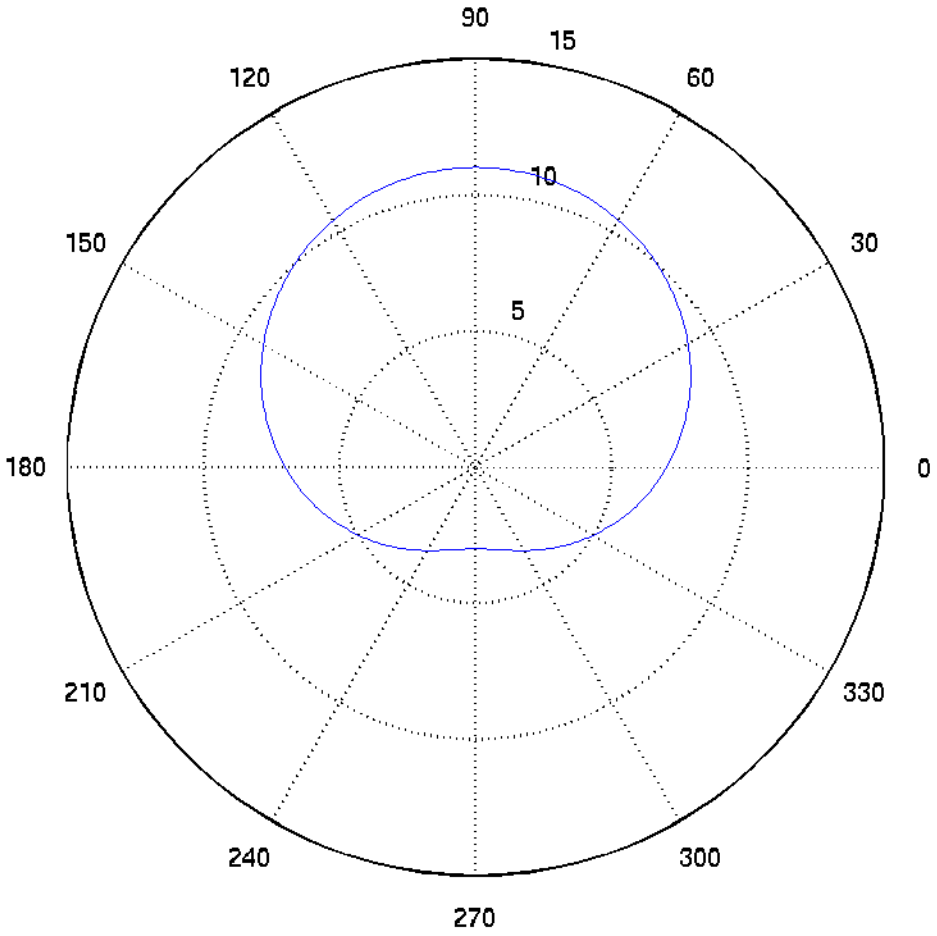

FIGURE 8. $r = 7 + 4\sin(a)$ - quite smooth sharp point

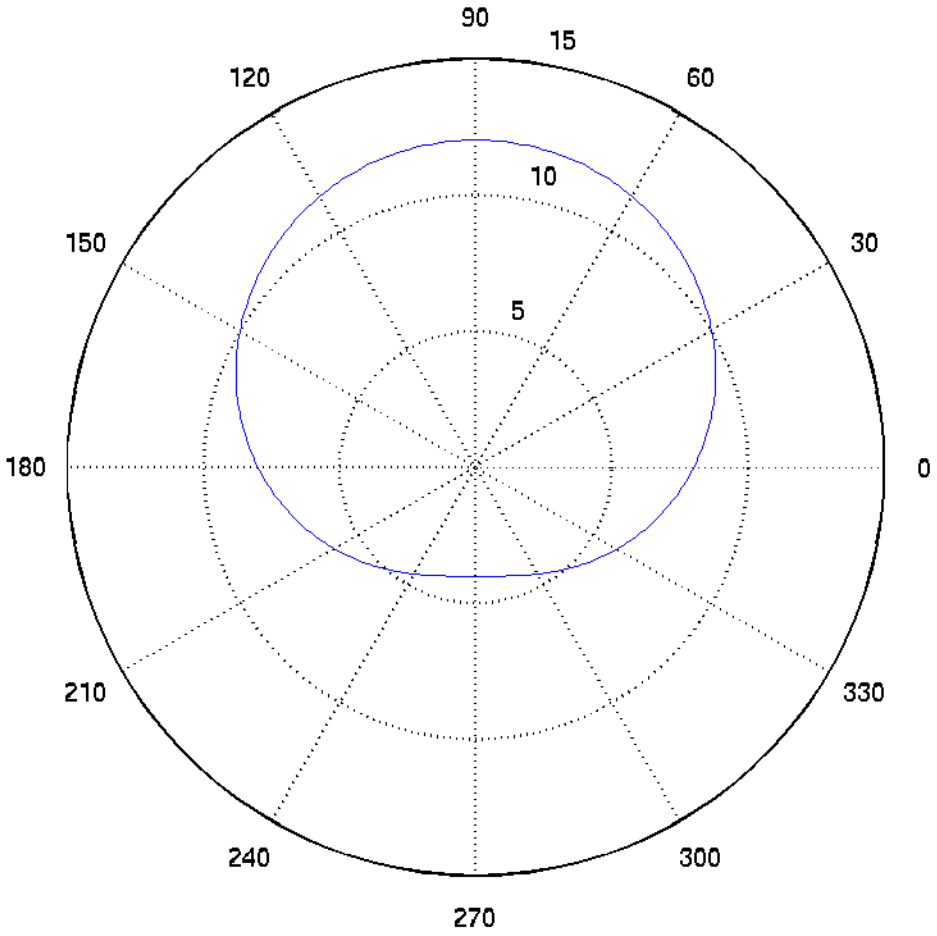

FIGURE 9. $r = 8 + 4\sin(a)$ - sharp point? where?