Q1: . Let g be defined by

$$g(r) = \cos(\kappa r)/\kappa - \frac{\cos(\kappa) + \sin(\kappa)i}{\kappa(J_0(\kappa) + J_1(\kappa)i)} J_0(\kappa r)$$

in poloar coordinate and $J_\nu(z)$ are the Bessel functions of the first kind. Let $f(r) = 0.15$ if $r < 0.25$ and $f(r) = g(r)$ if $r \geq 0.25$. Construct a 400×200 matrix F for function f on (x, y) belongs to $[-0.5, 0.5] \times [-1, 1]$. For $k = 3, 9, 15, 21$, and 27 approximate F by F_k using SVD and keeping k non-zero singular values. You can set $\kappa = 50$.

1. Plot the singular values of F as dot points.

2. Plot the images of $F, F_3, F_9, F_{15}, F_{21}$, and F_{27} using real parts (subplot command). Commpare the images and write down your conclusion.