**Exercise 1**

Masks are geometric filters on an image. For instance, if we want to extract a region of an image, we may do it by multiplying the matrix of the original image by a matrix of equal size containing 1′s in the region we want to keep and 0′s otherwise.

In this exercise we extract a circular region of the image [lena\_gray\_512.tif](http://www.unioviedo.es/compnum/labs/new/files/lena_gray_512.tif) of radious 150. Follow these steps:

* Read the image and convert it to double.
* Create a matrix of the same dimensions filled with zeros.
* Modify the above matrix to contain 1′s in a circle of radious 150, i.e. if (j−cx)2+(i−cy)2<150exp2, where (cx,cy) is the center of the image.
* Multiply the image by the mask (they are matrices!)
* Show the result.

When multiplying by zero, you set to black the pixels out of the circle. Modify the program to make visible those pixels with half the intensity.

**Hint**

**a.shape[0]** is the number of rows of **a** and **a.shape[1]** the number of columns.