Logical MATLAB Exercise

In image processing it can be very convenient to use logical filters and logical assignment instead of using for example the find() function. The logical operators in MATLAB are very useful and is stated in the short table below.

Logical filtering
can be done by simple assigning a variable the result of a logical operation.

Example: R is an M*N matrix containing real integers
A=(R>=20);
A will become an M*N matrix containing logicals which are only 0 for false and 1 for true based on whether the right logical condition is true or false for the corresponding element in R. In this example all elements in R that is greater than 20 will set the corresponding element in A true.

Logical assignment
Logical assignment lets you choose individual elements and assign them a different value.

Example: Let R be a M*N matrix containing real numbers and A be an M*N matrix containing logicals.

R(A)=5;
This operation will assign all elements in R where corresponding element in A is true the value 5 in this case.

Logical selection
One can easily select values an a large matrix which fulfills certain conditions by utilizing logical selection.

Example: Let R be a M*N matrix containing real numbers and A be an M*N matrix containing logicals.

B=R(A);
B will become a vector containing the values of those elements whose corresponding element in A is true.

Please feel free to experiment on your own, since logical operators are fast and very powerful in MATLAB.

Logicals in Matlab

~   not

| or

&   and

==   equal

~=   not equal

>   greater than

>=   greater equal

<=   less equal

<   less than

Example code

Here is an little code example of how to make an logical filter in an good way in matlab.

```
%define how big grid you want
N=512;
%create an vector to make the grid from
x=-N/2:1:N/2;
%creates an matrix contain the x-cordinats for each pixel
xmat=meshgrid(x);
%creates an matrix contain the y-cordinats for each pixel by transponder the x-matrix
ymat=xmat';
%make an matrix with the radius values from the center for each pixel
R=sqrt(xmat.^2+ymat.^2);
%creating an logical filter
logicalFilter=(xmat>0 & R>100);
%displaying the logical filter
imshow(logicalFilter)
```

The above example code gives this resulting image
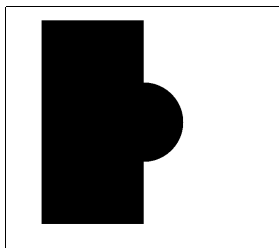
Exercise

modify the code above to make the following images: