R tips for plotting a function of two variables

Suppose, for example, we want to plot the function $f(x, y) = (1/(2\pi))\exp(-0.5(x^2 + y^2))$ as a surface in 3 dimensions. Here is how to get started in R, by making a grid of x and y values and then evaluating z=f(x, y) at each of those values:

```
f <- function(x,y){1/(2*pi)*exp(-0.5*(x^2+y^2))}
x <- seq(-4,4,.1)
y <- x
m <- length(x)
n <- length(y)
z <- array(0,dim=c(m,n))
for(i in 1:m){
   for(j in 1:n){
        z[i,j] <- f(x[i],y[j])
     }
}</pre>
```

Now we'll do the plot in two ways.

1. Using the persp function

```
persp(x,y,z,theta=30, phi=30, expand=0.5,
  col="lightblue", zlab="z=f(x,y)",
  ticktype="detailed",
  shade=.75, lphi=45, ltheta=135)
```

It works pretty much as well without the shade, lphi, and ltheta arguments. They were just for fun. As always, for a quick look at more info you can do persp in R.

2. Using the rgl library

You need to install the rgl package. Then you can do this:





```
library(rgl)
open3d()
bg3d("white")
surface3d(x, y, z, col="lightgreen")
aspect3d(1,1,0.5)
bbox3d(back="lines")
```

A cool thing about this way is that you can rotate the picture with your mouse.