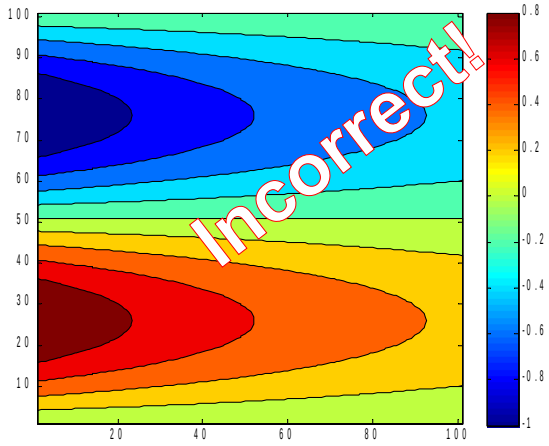
Correct way to use the contour/contourf function in Matlab

Let's use the example with u(x,y) = sin(2πx)exp(−y). The contour map of u should show oscillatory behavior in x and exponential decay in y.

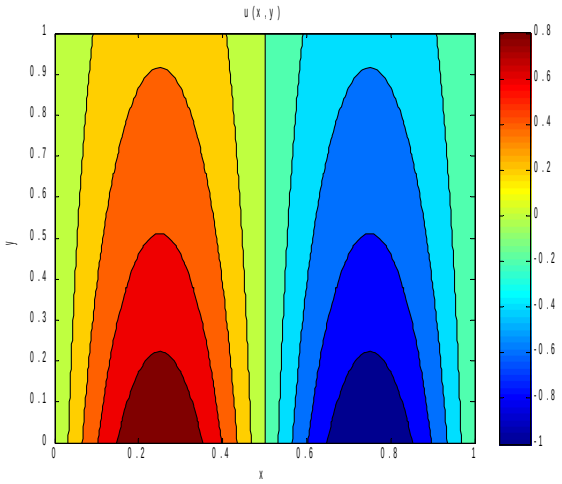
1. The incorrect way (without proper definitions of the x and y coordinates for the 2D grid)

```
clear
x = [0:0.01:1];
y = [0:0.01:1];
for i = 1:length(x)
for j = 1:length(y)
  u(i,j) = sin(2*pi*x(i))*exp(-y(j));
end
end
contourf(u)
contourcbar
```



2. The correct way

```
clear
x = [0:0.01:1];
y = [0:0.01:1];
for i = 1:length(x)
for j = 1:length(y)
  x2d(i,j) = x(i);
  y2d(i,j) = y(j);
  u(i,j) = sin(2*pi*x(i))*exp(-y(j));
end
end
contourf(x2d,y2d,u)
xlabel('x');ylabel('y');
title('u(x,y)')
contourcbar
```



Note: "contourcbar" is a new feature of Matlab 2012a (or later version). If you have an older version of Matlab, use "colorbar" instead.