**Task 4**



* As and are independent .

So joint PDF for and is

* Next, we can draw its level curves. For that we need to draw graphs of for different values of .

First let’s modify the equation in general case.

From this we can conclude, that level lines of joint PDF are concentric circles with center at point (0;0) and radius .

Here we have some restrictions:

1) must be greater than 0, so ;

2) *.*

Hence, *.*

We can also see, that maximum value is achieved at .

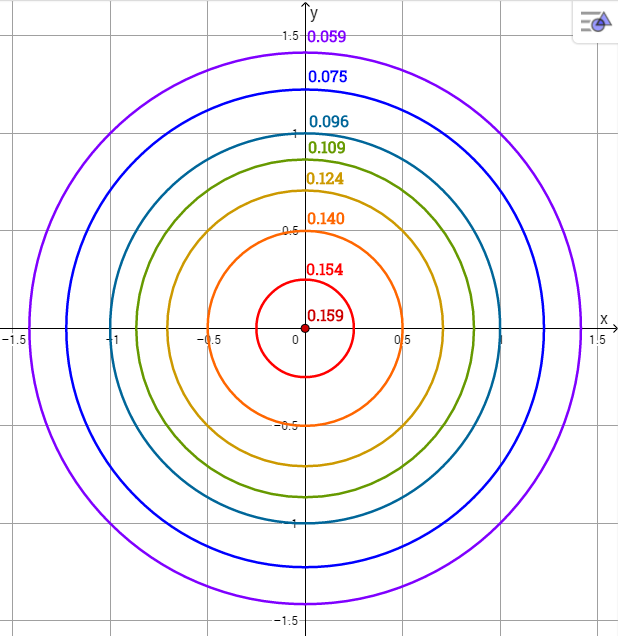
Next let’s calculate radius R of level lines for different values of C.

For simplicity I’ll consider values of C in the form .

We can see that for such values of , so for every power in we get a circle of radius .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  | Level curves |
|  | 0.15916 | 0 | 0 |  |
|  | 0.15426 | 1/32 | 1/4 |  |
|  | 0.14045 | 1/8 | 1/2 |  |
|  | 0.12395 |  |  |  |
|  | 0.10939 |  |  |  |
|  | 0.09653 |  | 1 |  |
|  | 0.07518 |  |  |  |
|  | 0.05855 | 1 |  |  |

Level curves of are shown in the graph below.



\*Made and colored “by hand” in Geogebra app :)