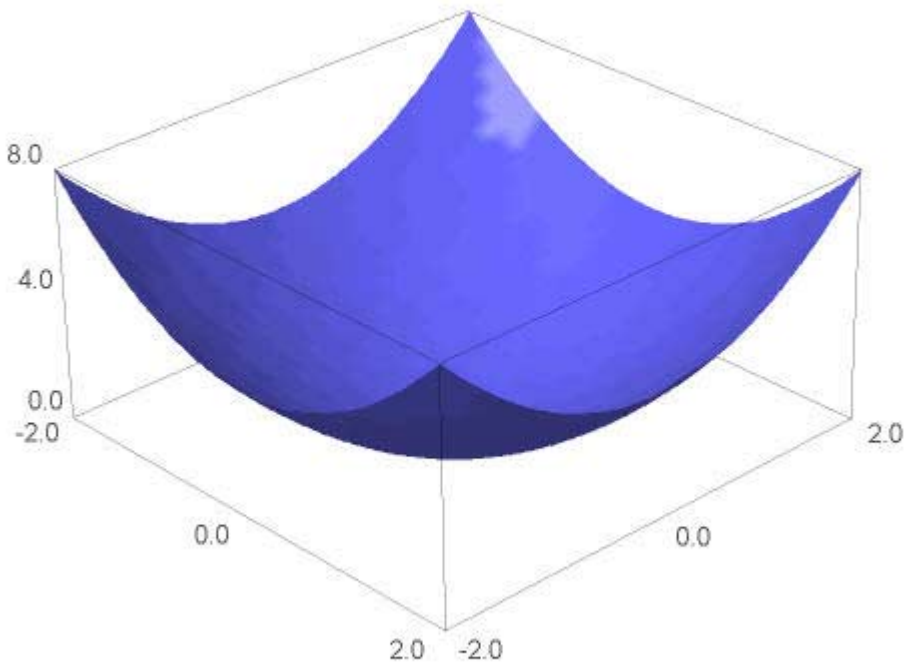
Vector Analysis - double integral

Plotting of functions in two variables

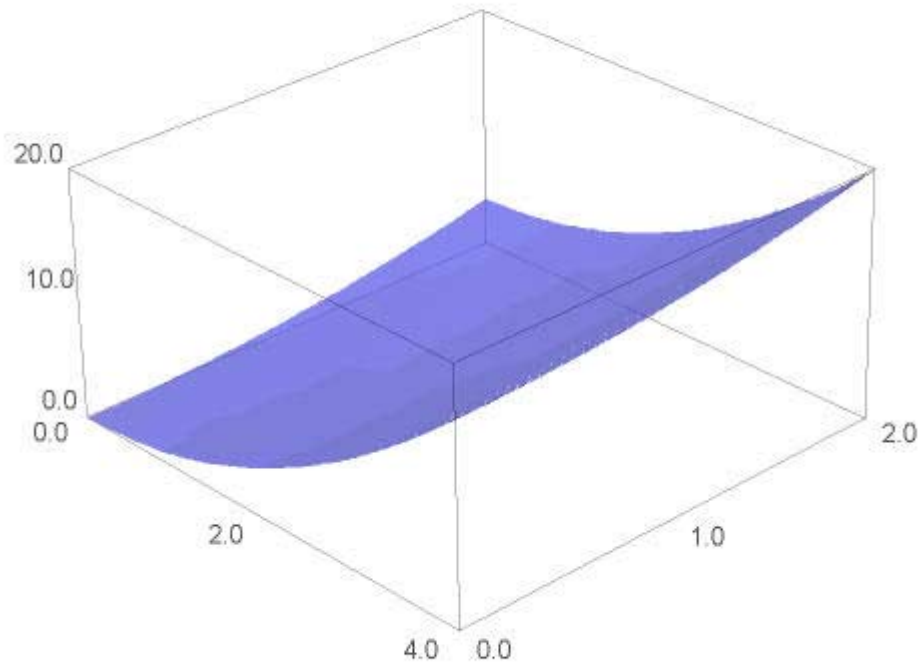
Let us plot the function f(x,y) = x^2 + y^2.

```
x, y, z = var('x, y, z')
plot3d(x^2 + y^2, (x,-2,2), (y,-2,2))
```



Now we define this in the range 0<=x <=4 and 0<= y<= 2 as we want,
and save this plot as P:

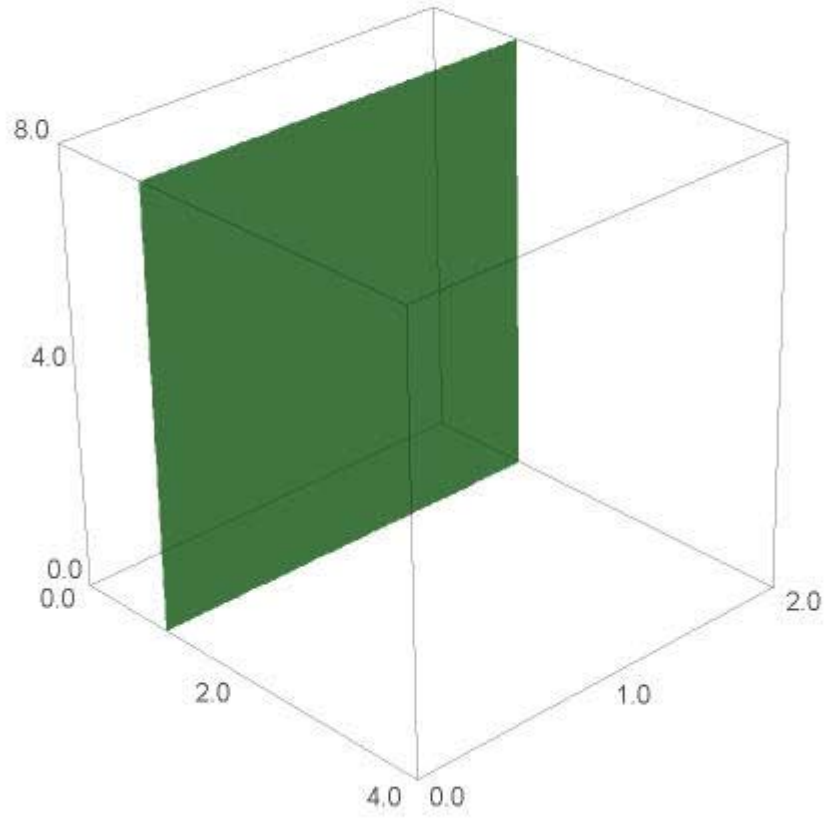
```
P = plot3d(x^2 + y^2, (x,0,4), (y,0,2),opacity=0.7)
show(P)
```



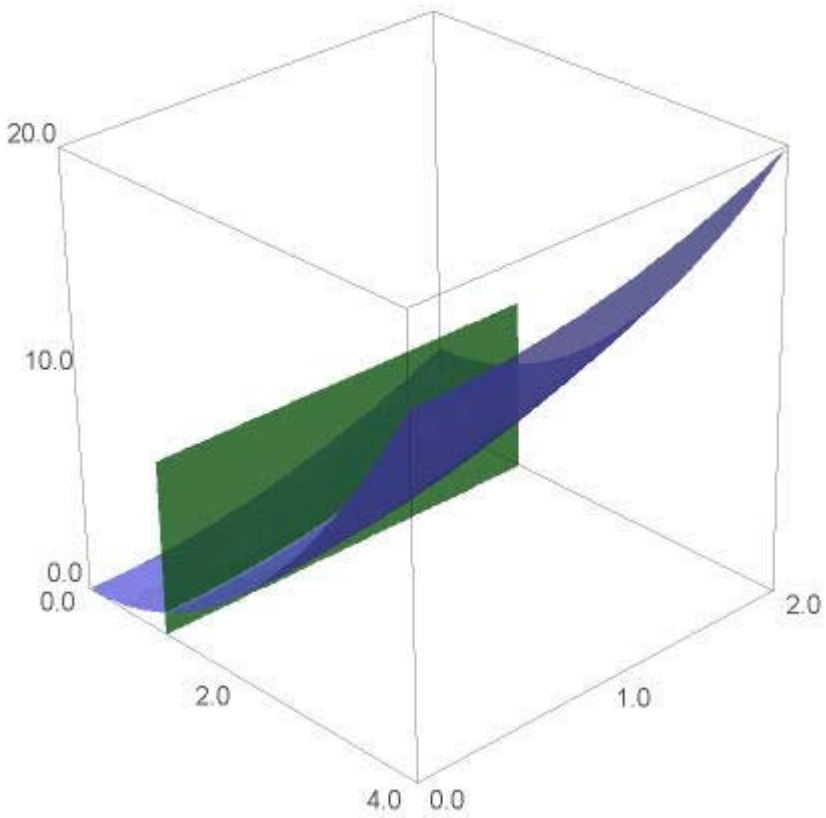
Iterated integrals

Taking a particular slice for a fixed x (in this case x=1), we can demonstrate which areas we are summing successively when we evaluate a double integral by iterated integrals.

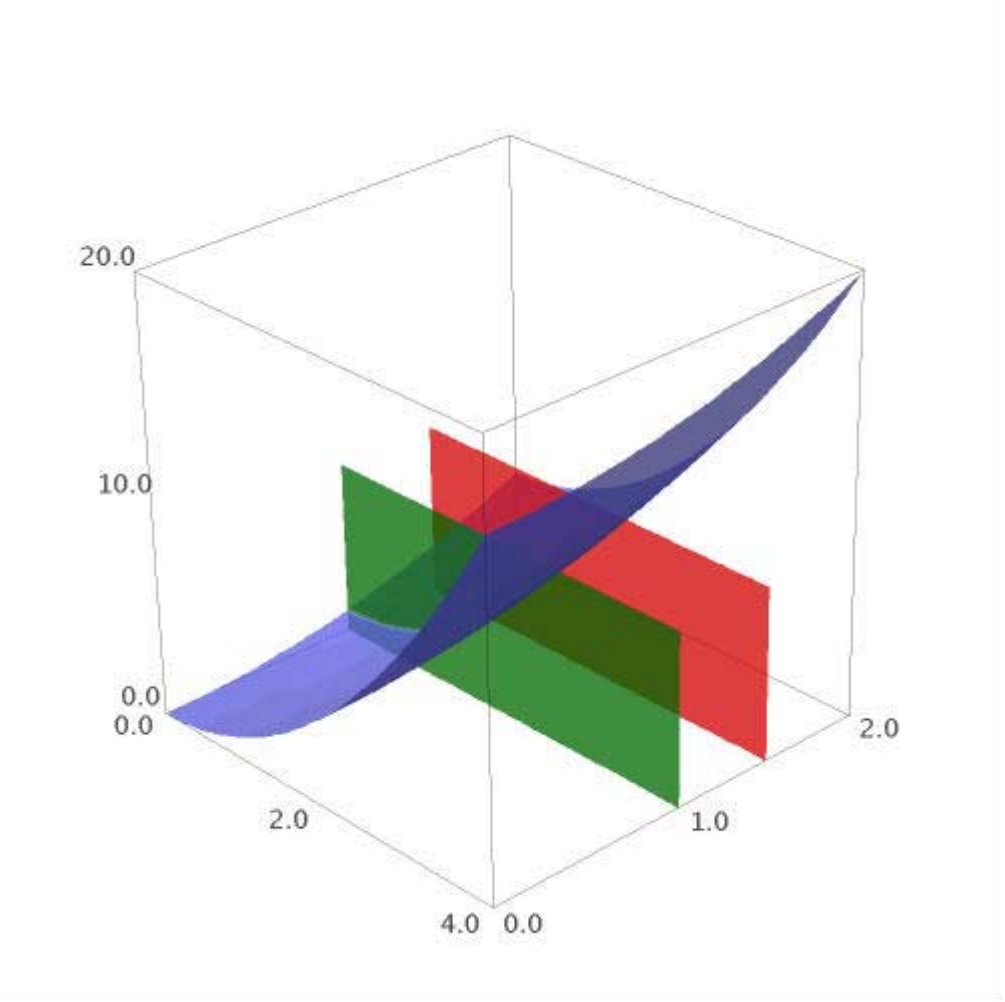
```
Q = implicit_plot3d(x-1,(x,0,4),(y,0,2),(z,0,8),color='green',opacity=0.7)
show(Q)
```




```
show(P+Q)
```

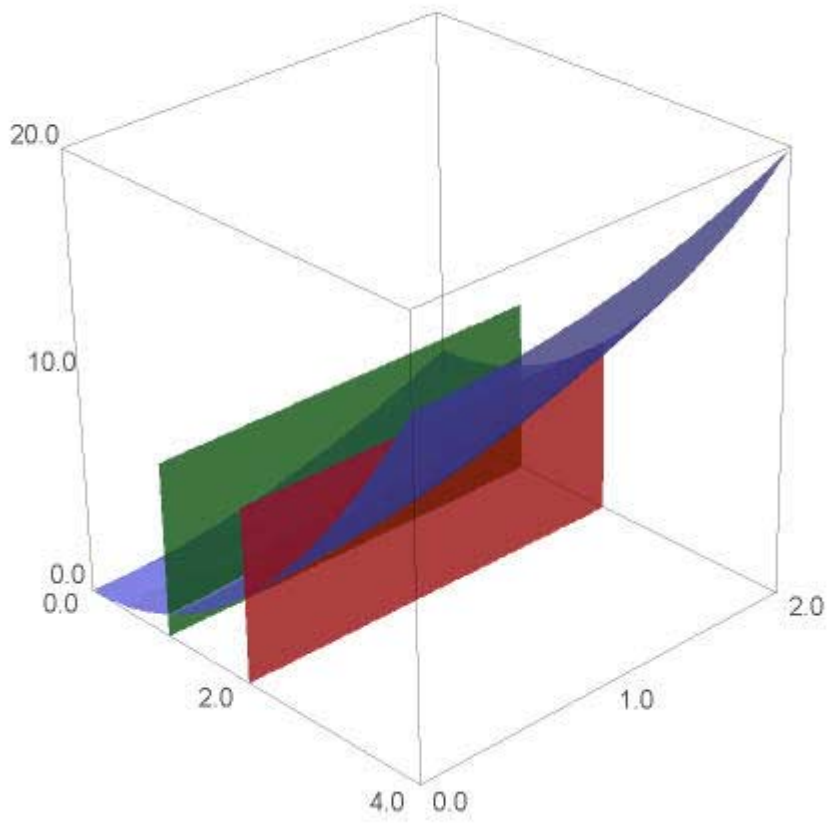



```
R = implicit_plot3d(x-2,(x,0,4),(y,0,2),(z,0,8),color='red',opacity=0.7)
show(P+Q+R)
```



Similarly, we could keep y fixed and sum over integral in x:

```
Q = implicit_plot3d(y-1,(x,0,4),(y,0,2),(z,0,8),color='green',opacity=0.7)
R = implicit_plot3d(y-1.5,(x,0,4),(y,0,2),(z,0,8),color='red',opacity=0.7)
show(P+Q+R)
```


20.0
10.0
0.0
0.0
2.0
4.0
0.0
1.0
2.0