We examine some surfaces of the form x^ + y^2 + a*xy. Think about how the second mixed partial derivative f_xy changes.

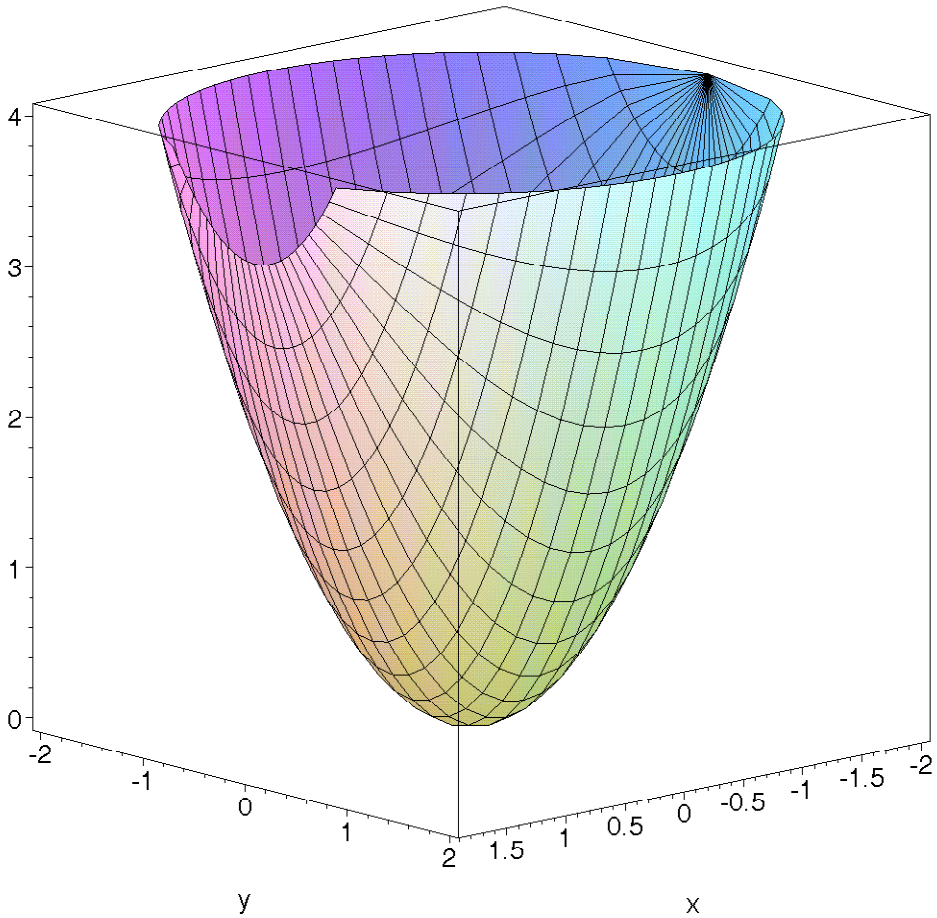
```
>
> with(plots):
> r:=2; #radius of the domina in the xy plane
```

$$r := 2$$

```
> e:=x^2 + y^2;
```

$$e := x^2 + y^2$$

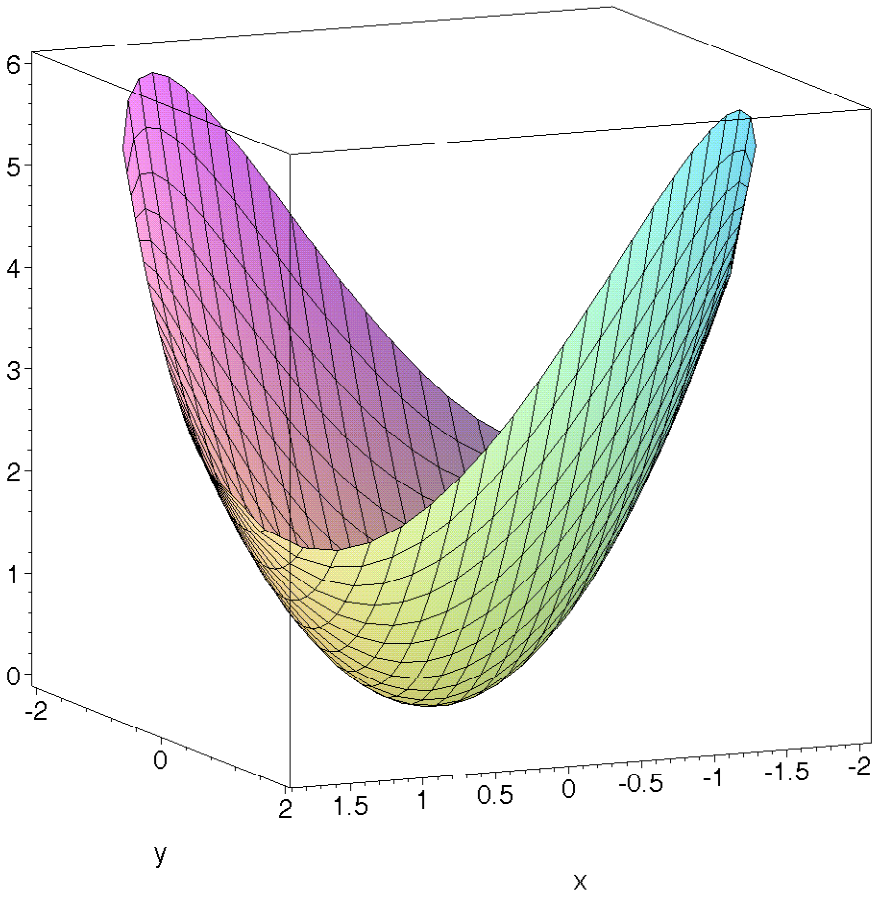
```
> plot3d(e,x=-r..r, y=-sqrt(r^2- x^2)..sqrt(r^2- x^2), axes=
  boxed);
```




```
> f:=x^2+y^2-x*y;
```

$$f := x^2 + y^2 - x\,y$$

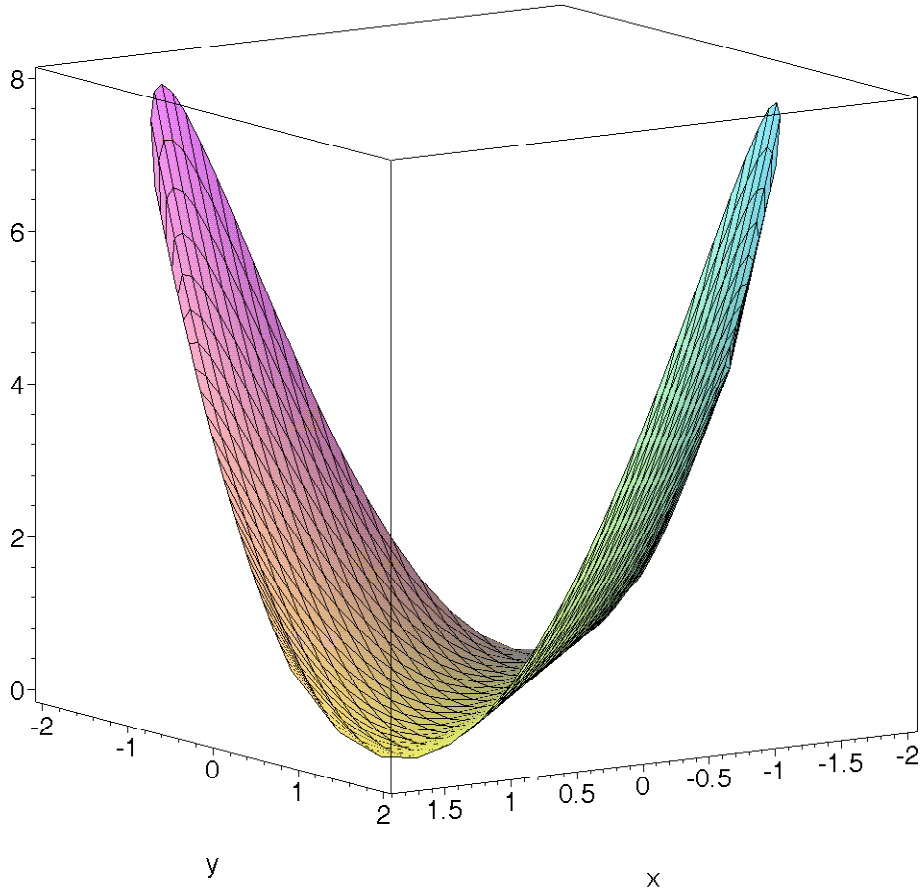
```
> plot3d(f,x=-r..r, y=-sqrt(r^2- x^2)..sqrt(r^2- x^2), axes=
  boxed);
```




```
>
> g:=x^2+y^2-2*x*y; # note g = (x-y)^2
```

$$g := x^2 + y^2 - 2\,x\,y$$

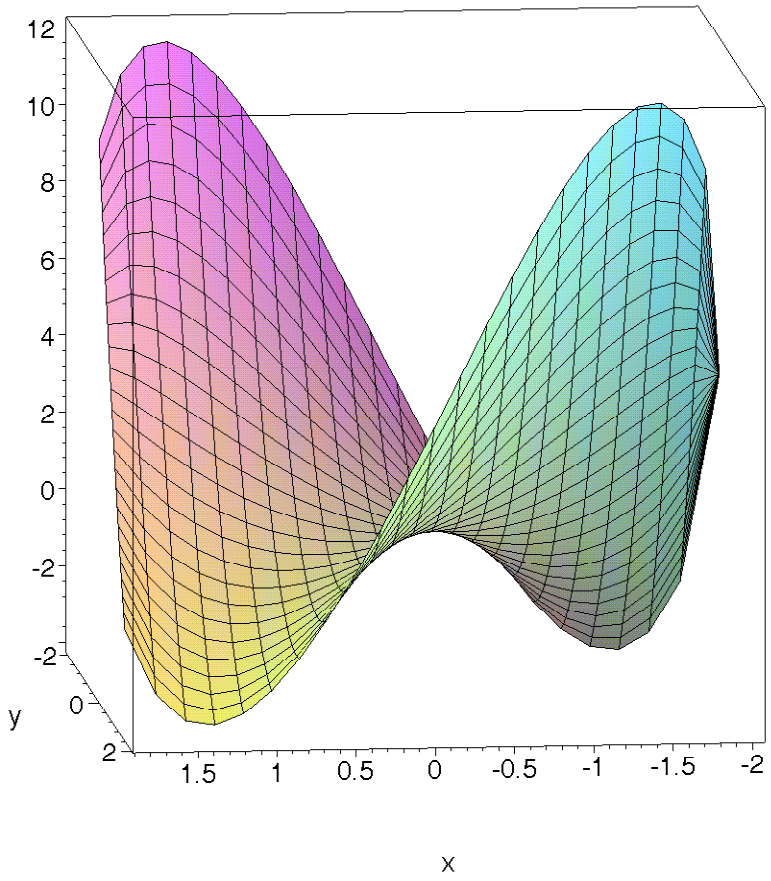
```
> plot3d(g,x=-r..r, y=-sqrt(r^2- x^2)..sqrt(r^2- x^2), axes=
  boxed);
```



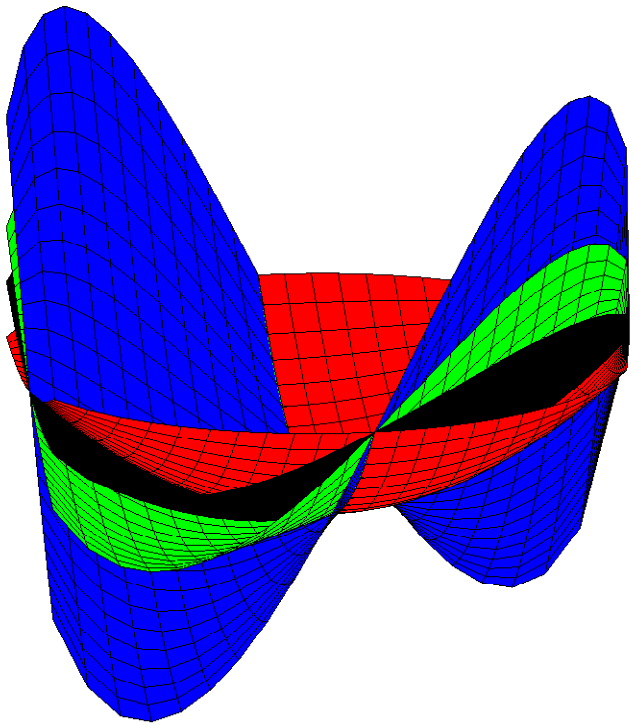

```
> h:=x^2+y^2-4*x*y;
```

$$h := x^2 + y^2 - 4\,x\,y$$

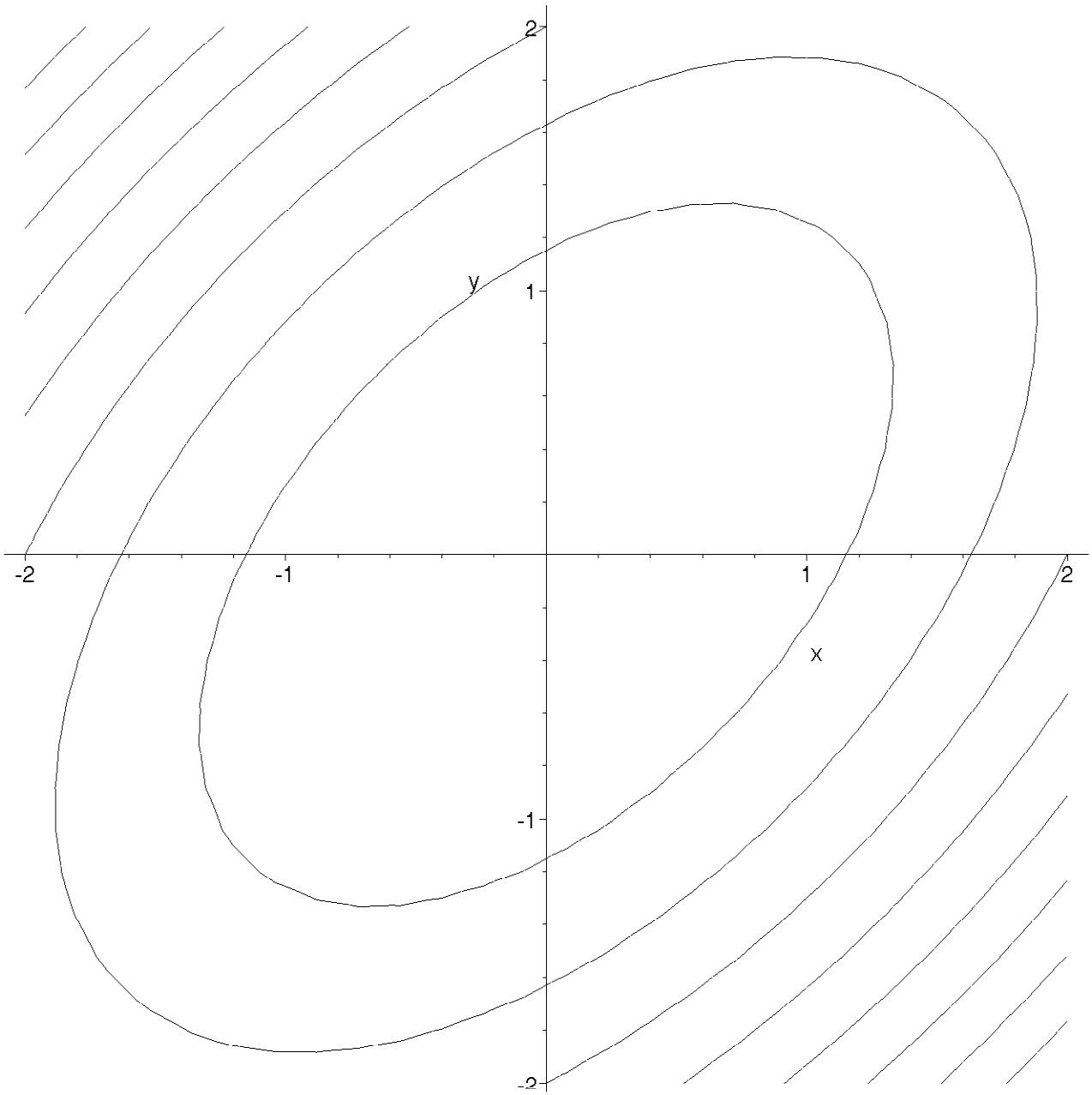
```
> plot3d(h,x=-r..r, y=-sqrt(r^2- x^2)..sqrt(r^2- x^2), axes=
  boxed);
```



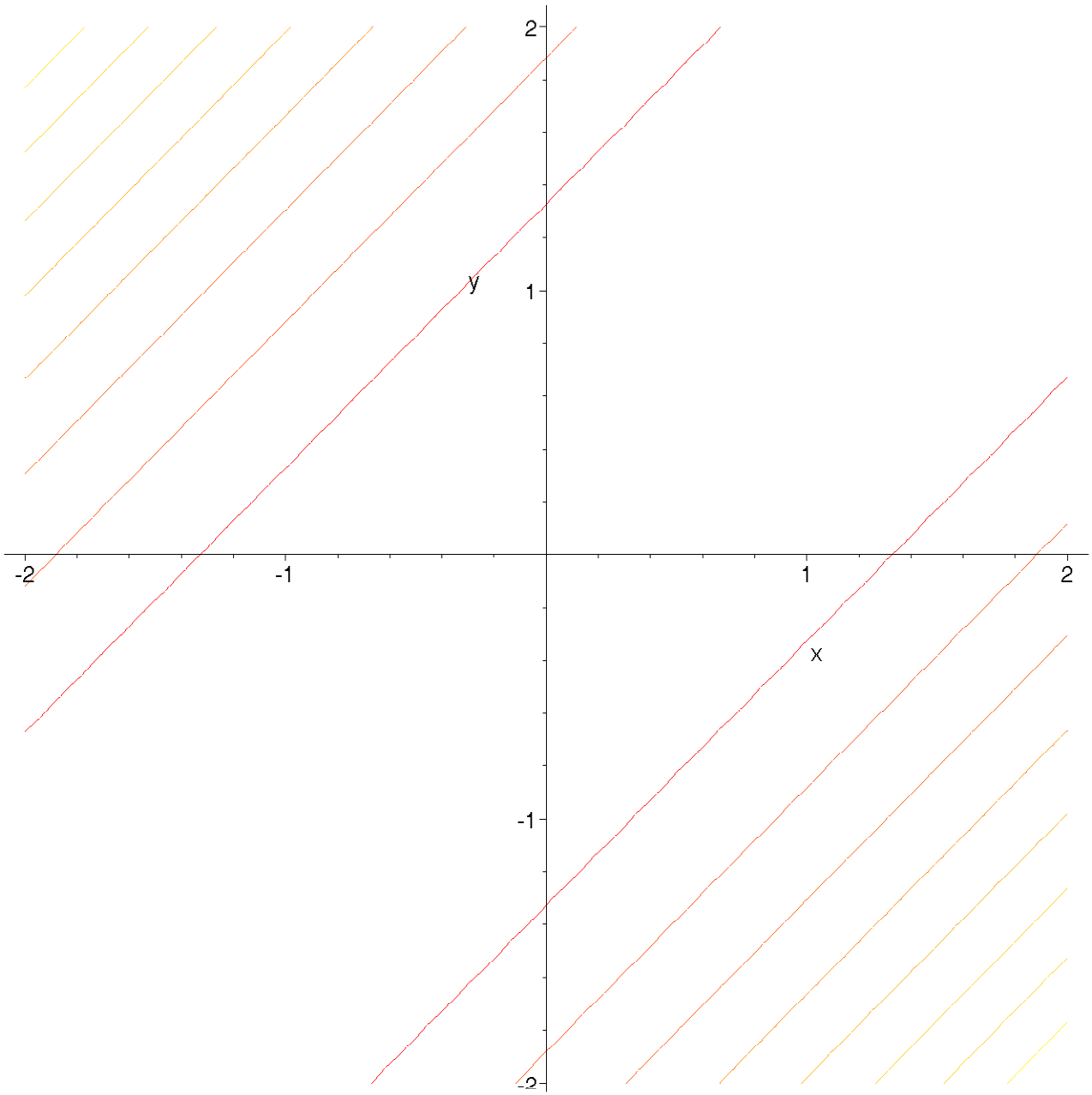

```
> a:=plot3d(e,x=-r..r,y=-sqrt(r^2- x^2)..sqrt(r^2-
  x^2),color=red):
> b:=plot3d(f,x=-r..r,y=-sqrt(r^2- x^2)..sqrt(r^2-
  x^2),color=black):
> c:=plot3d(g,x=-r..r,y=-sqrt(r^2- x^2)..sqrt(r^2-
  x^2),color=green):
> d:=plot3d(h,x=-r..r,y=-sqrt(r^2- x^2)..sqrt(r^2-
  x^2),color=blue):
> display({a,b,c,d});
```



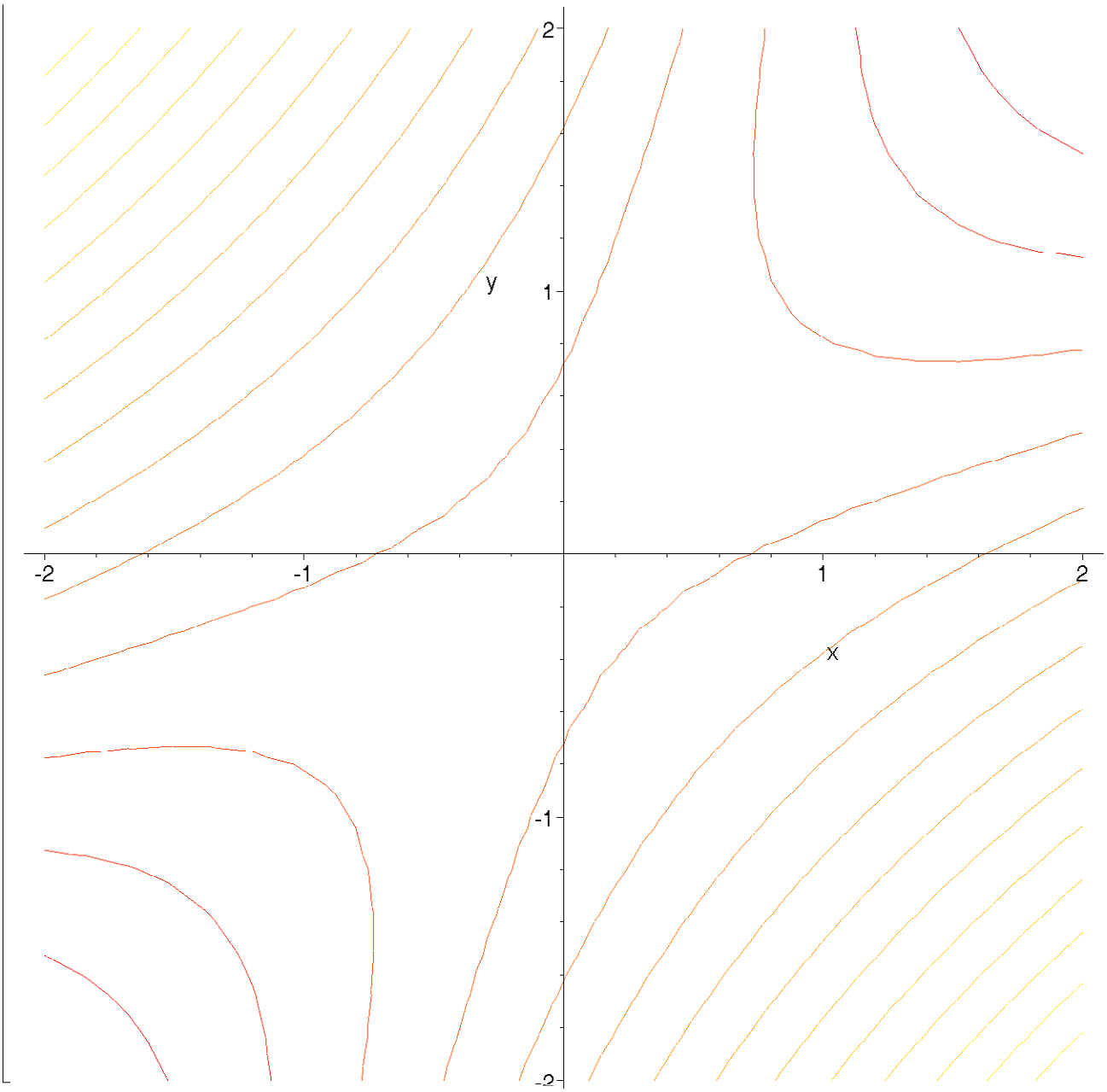
```
> contourplot(f,x=-r..r,y=-r..r,color=black);
```




```
> contourplot(g,x=-r..r,y=-r..r);
```




```
> contourplot(h,x=-r..r,y=-r..r,contours=14);
```


2
1
-1
-2
-2
-1
1
2
y
x

>

>

>