

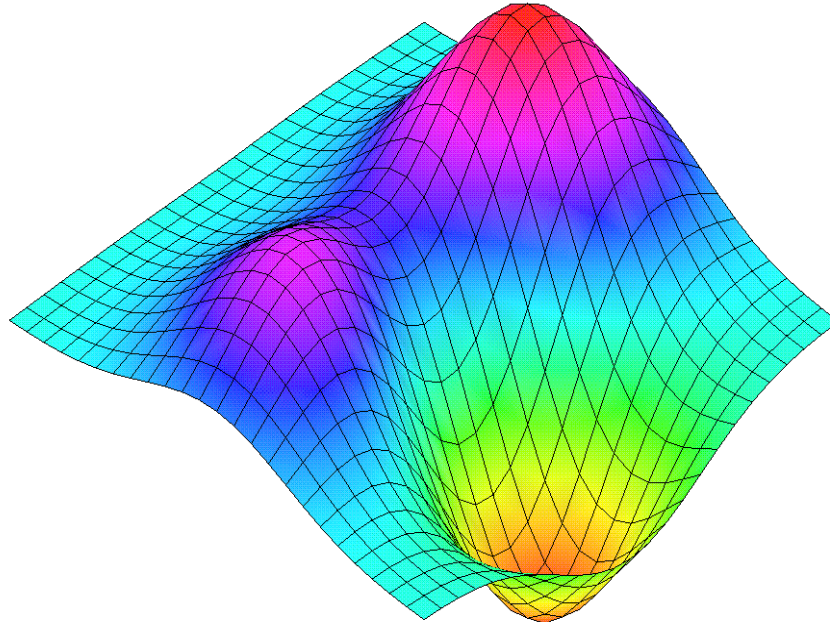
Übungsblatt 2 (Funktionen)

```
> restart;
```

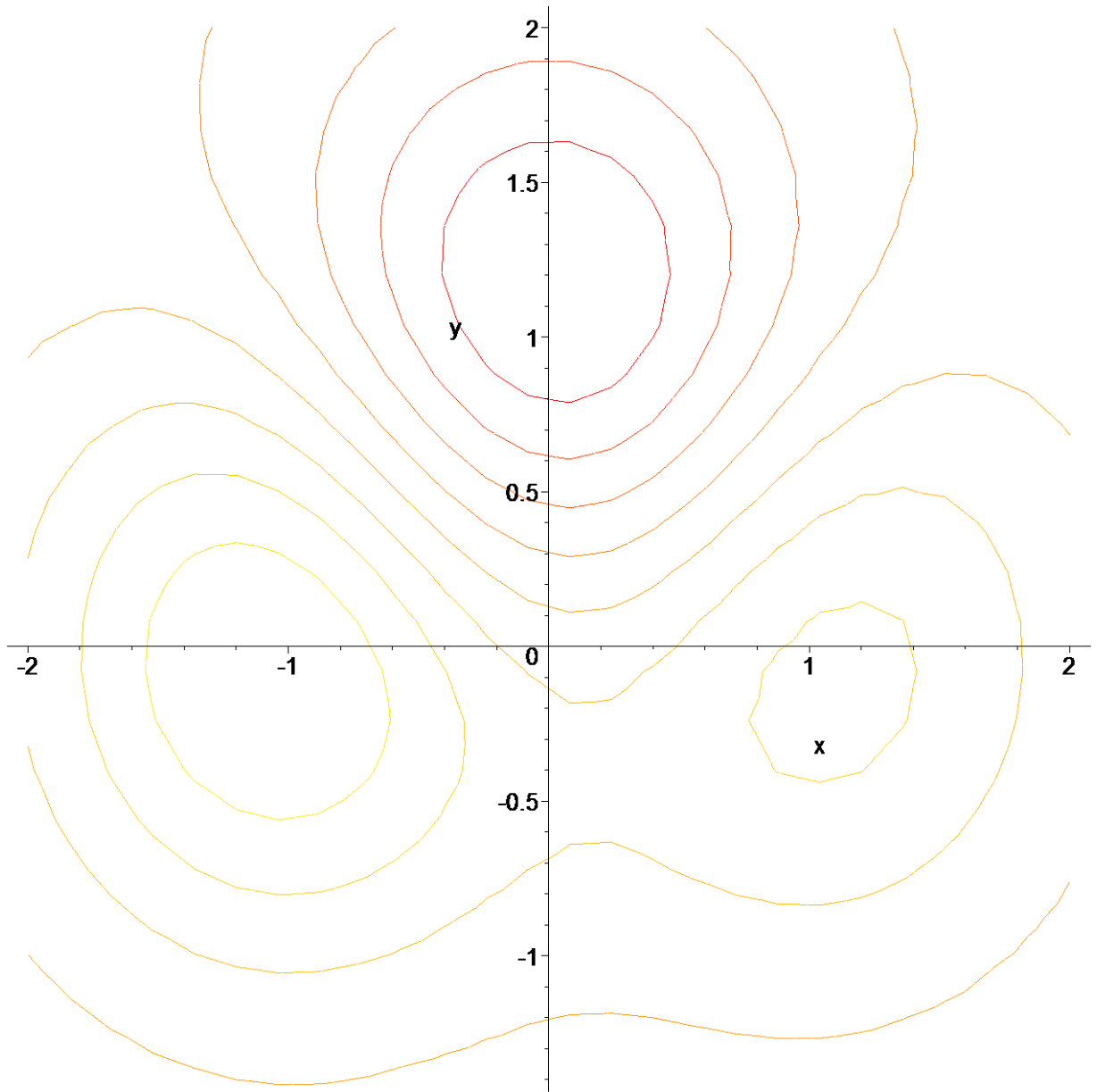
- Funktionsplot

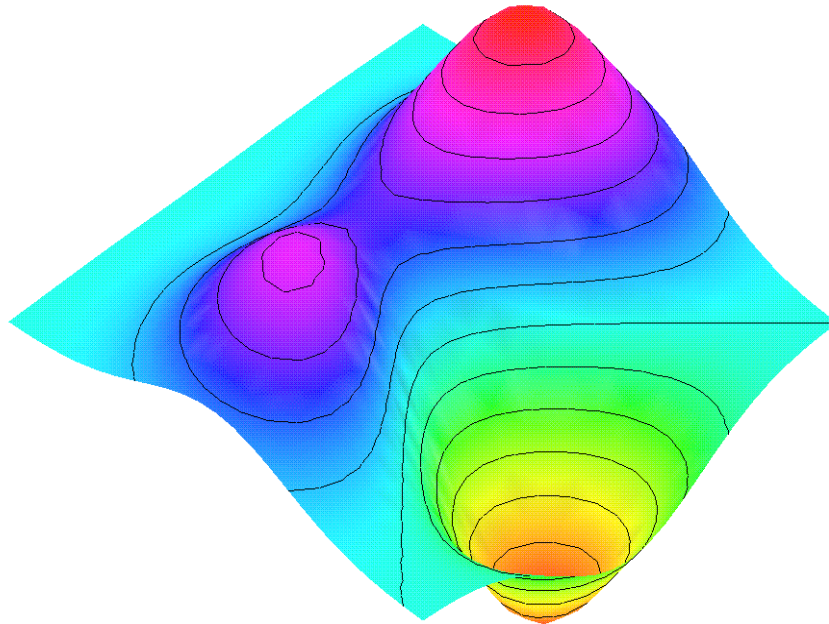
```
> f := (x,y) -> exp(-(x-1)^2 - y^2) - 3/2*exp(-x^2-(y-1)^2) +  
3/2*exp(-(x+1)^2 - y^2);  
> plot3d(f(x,y), x=-2..2, y=-2..2, color=f(x,y));  
> with(plots):  
> contourplot(f(x,y), x=-2..2, y=-2..2);  
> plot3d(f(x,y), x=-2..2, y=-2..2, color=f(x,y),  
style=patchcontour);
```

$$f := (x, y) \rightarrow e^{-(x-1)^2 - y^2} - \frac{3}{2} e^{-(x^2 - (y-1)^2)} + \frac{3}{2} e^{-(x+1)^2 - y^2}$$



Warning, the name changecoords has been redefined





- Rekursiv definiertes plus, mal, hoch

```
> a := (n,m) -> `if`(m=0, n, a(n+1, m-1));
> a(5,3);
```

$$a := (n, m) \rightarrow \text{if}(m = 0, n, a(n + 1, m - 1))$$

8

```
> b := (n,m) -> `if`(m=1, n, a(n, b(n, m-1)));
> b(3,4);
> b(5,2);
```

$$b := (n, m) \rightarrow \text{if}(m = 1, n, a(n, b(n, m - 1)))$$

12
10

```
> c := (n,m) -> `if`(m=1, n, b(n, c(n, m-1)));
> c(3,4);
```

$$c := (n, m) \rightarrow \text{if}(m = 1, n, b(n, c(n, m - 1)))$$

- Rekursive Funktionen mit Ausgabe

Das sind die Funktionen a, b, c vom Blatt 2.

Der einzige Unterschied in der Ausführung entsteht durch die Option 'trace', im übrigen ist es nur eine andere Notation - was es damit genau auf sich hat, wird später erklärt.

```
> restart;
```

```
> a := proc(n,m) option operator,arrow,trace; `if`(m=0,n,
  a(n+1, m-1)) end;
```

```
> a(5,2);
```

$$a := (n, m) \rightarrow \text{`if`}(m = 0, n, a(n + 1, m - 1))$$

```
{--> enter a, args = 5, 2
```

```
{--> enter a, args = 6, 1
```

```
{--> enter a, args = 7, 0
```

```
7
```

```
<-- exit a (now in a) = 7}
```

```
7
```

```
<-- exit a (now in a) = 7}
```

```
7
```

```
<-- exit a (now at top level) = 7}
```

```
7
```

```
> b := proc(n,m) option operator,arrow,trace; `if`(m=1,n,a(n,
  b(n, m-1))) end;
```

```
> b(5,2);
```

$$b := (n, m) \rightarrow \text{`if`}(m = 1, n, a(n, b(n, m - 1)))$$

```
{--> enter b, args = 5, 2
```

```
{--> enter b, args = 5, 1
```

```
5
```

```
<-- exit b (now in b) = 5}
```

```
{--> enter a, args = 5, 5
```

```
{--> enter a, args = 6, 4
```

```
{--> enter a, args = 7, 3
```

```
{--> enter a, args = 8, 2
```

```
{--> enter a, args = 9, 1
```

```
{--> enter a, args = 10, 0
```

```
10
```

```
<-- exit a (now in a) = 10}
```

```
10
```

```
<-- exit a (now in a) = 10}
```

```
10
```

```
<-- exit a (now in a) = 10}
```

```
10
```

```
<-- exit a (now in a) = 10}
```

```
10
```

```
<-- exit a (now in a) = 10}
```

```
10
```

```
<-- exit a (now in b) = 10}
```

```
10
```

```
<-- exit b (now at top level) = 10}
```

```
> c := proc(n,m) option operator,arrow,trace; `if`(m=1, n, b(n,
  c(n, m-1))) end;
> c(3,2);
```

```
      c := (n, m) → `if`(m = 1, n, b(n, c(n, m - 1)))
```

```
{--> enter c, args = 3, 2
{--> enter c, args = 3, 1
```

3

```
<-- exit c (now in c) = 3}
{--> enter b, args = 3, 3
{--> enter b, args = 3, 2
{--> enter b, args = 3, 1
```

3

```
<-- exit b (now in b) = 3}
{--> enter a, args = 3, 3
{--> enter a, args = 4, 2
{--> enter a, args = 5, 1
{--> enter a, args = 6, 0
```

6

```
<-- exit a (now in a) = 6}
```

6

```
<-- exit a (now in a) = 6}
```

6

```
<-- exit a (now in a) = 6}
```

6

```
<-- exit a (now in b) = 6}
```

6

```
<-- exit b (now in b) = 6}
{--> enter a, args = 3, 6
{--> enter a, args = 4, 5
{--> enter a, args = 5, 4
{--> enter a, args = 6, 3
{--> enter a, args = 7, 2
{--> enter a, args = 8, 1
{--> enter a, args = 9, 0
```

9

```
<-- exit a (now in a) = 9}
```

9

```
<-- exit a (now in a) = 9}
```

9

```
<-- exit a (now in a) = 9}
```

9

```
<-- exit a (now in a) = 9}
```

9

```
<-- exit a (now in a) = 9}
```

9

```
<-- exit a (now in a) = 9}
```

9

```
<-- exit a (now in b) = 9}
```

9

```
<-- exit b (now in c) = 9}
```

```
    | <-- exit c (now at top level) = 9} 9
  [ > 9
  [ >
```