

```
> restart;
```

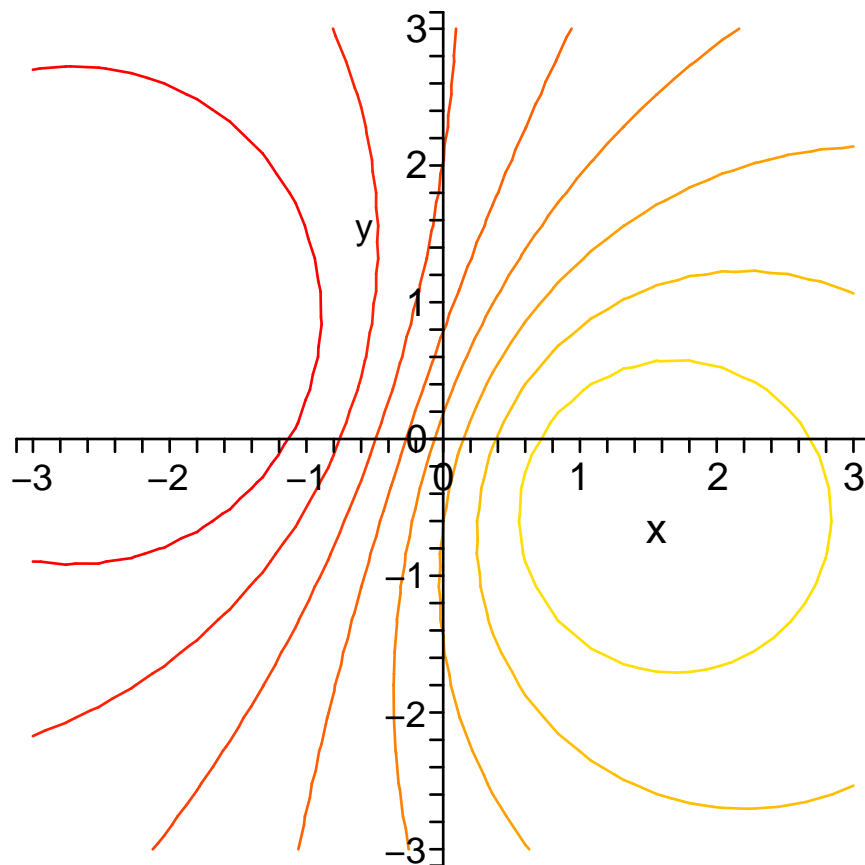
```
> z:=(1+3*x-y)/(3+x^2+y^2);
```

$$z := \frac{1 + 3x - y}{3 + x^2 + y^2}$$

```
> with(plots):
```

Warning, the name changecoords has been redefined

```
> contourplot(z,x=-3..3,y=-3..3);
```



```
> dzdx:=diff(z,x);  
dzdy:=diff(z,y);
```

$$dzdx := \frac{3}{3 + x^2 + y^2} - \frac{2(1 + 3x - y)x}{(3 + x^2 + y^2)^2}$$

$$dzdy := -\frac{1}{3 + x^2 + y^2} - \frac{2(1 + 3x - y)y}{(3 + x^2 + y^2)^2}$$

```
> with(codegen):
```

```
Warning, the protected name MathML has been redefined and unprotected
```

```
> fortran(dzdx);
```

```
t0 = 3/(3+x**2+y**2)-2*(1+3*x-y)/(3+x**2+y**2)**2*x
```

```
> dzdxo:= [optimize(simplify(dzdx))];
```

```
dzdxo:= [ t1 = x2, t3 = y2, t10 = (3 + t1 + t3)2, t13 = -  $\frac{-9 + 3 t1 - 3 t3 + 2 x - 2 x y}{t10}$  ]
```

```
> fortran(dzdxo);
```

```
t1 = x**2
```

```
t3 = y**2
```

```
t10 = (3+t1+t3)**2
```

```
t13 = -(-9+3*t1-3*t3+2*x-2*x*y)/t10
```

```
> fortran([optimize(simplify(dzdy))]);
```

```
t1 = x**2
```

```
t2 = y**2
```

```
t8 = (3+t1+t2)**2
```

```
t11 = -(3+t1-t2+2*y+6*x*y)/t8
```

```
> d2zdx2:=diff(dzdx,x);
```

```
d2zdy2:=diff(dzdy,y);
```

```
d2zdxdy:=diff(dzdx,y);
```

$$d2zdx2 := -\frac{12x}{(3+x^2+y^2)^2} + \frac{8(1+3x-y)x^2}{(3+x^2+y^2)^3} - \frac{2(1+3x-y)}{(3+x^2+y^2)^2}$$

$$d2zdy2 := \frac{4y}{(3+x^2+y^2)^2} + \frac{8(1+3x-y)y^2}{(3+x^2+y^2)^3} - \frac{2(1+3x-y)}{(3+x^2+y^2)^2}$$

$$d2zdxdy := -\frac{6y}{(3+x^2+y^2)^2} + \frac{2x}{(3+x^2+y^2)^2} + \frac{8(1+3x-y)xy}{(3+x^2+y^2)^3}$$

```
> dzdx;
```

$$\frac{3}{3+x^2+y^2} - \frac{2(1+3x-y)x}{(3+x^2+y^2)^2}$$

```
> evalf(subs({x=1,y=1},dzdx));
```

```
0.3600000000
```

```
> fortran([optimize(simplify(d2zdx2))]);
```

```
t2 = x**2
```

```
t5 = y**2
```

```
t14 = 3+t2+t5
```

```
t15 = t14**2
t19 = 2*(-27*x+3*t2*x-9*x*t5+3*t2-3*t2*y-3-t5+3*y+t5*y)/t15/t14
```

```
> fortran([optimize(simplify(d2zdy2))]);
```

```
t2 = x**2
t5 = y**2
t14 = 3+t2+t5
t15 = t14**2
t20 = -2*(-9*y-3*t2*y+t5*y-3*t5-9*x*t5+3+t2+9*x+3*t2*x)/t15/t14
```

```
> fortran([optimize(simplify(d2zdxdy))]);
```

```
t2 = x**2
t5 = y**2
t15 = 3+t2+t5
t16 = t15**2
t20 = 2*(-9*y+9*t2*y-3*t5*y+3*x+t2*x-3*x*t5+4*x*y)/t16/t15
```

```
> fortran([optimize(['d2zdx2'=simplify(d2zdx2), 'd2zdy2'=simplify(d2zdy2), 'c
zdxdy'=simplify(d2zdxdy)'])]);
```

```
t2 = x**2
t3 = t2*x
t4 = 3*t3
t5 = y**2
t6 = x*t5
t7 = 9*t6
t9 = t2*y
t10 = 3*t9
t12 = t5*y
t14 = 3+t2+t5
t15 = t14**2
t17 = 1/t15/t14
d2zdx2 = 2*(-27*x+t4-t7+3*t2-t10-3-t5+3*y+t12)*t17
t19 = 9*y
d2zdy2 = -2*(-t19-t10+t12-3*t5-t7+3+t2+9*x+t4)*t17
d2zdxdy = 2*(-t19+9*t9-3*t12+3*x+t3-3*t6+4*x*y)*t17
```

```
>
```