```
> restart;
> eq:=D(y)=(s->f(s,y(s)));
```

$$eq := \mathrm{D}(y) = (s \mapsto f(s, y(s))) \quad (1)$$

```
> yp:=y(xn-h)+2*h*f(xn,y(xn));
```

$$yp := y(xn-h) + 2\,h\,f(xn, y(xn)) \quad (2)$$

```
> ynp1:=y(xn)+h/2*(f(xn,y(xn))+f(xn+h,yp));
```

$$ynp1 := y(xn) + \frac{h\,(f(xn, y(xn)) + f(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn))))}{2} \quad (3)$$

```
> r:=y(xn+h)-ynp1;
```

$$r := y(xn+h) - y(xn) - \frac{h\,(f(xn, y(xn)) + f(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn))))}{2} \quad (4)$$

```
> subs(h=0,r);
```

$$0 \quad (5)$$

```
> T1:=diff(r,h);
```

$$T1 := \mathrm{D}(y)(xn+h) - \frac{f(xn, y(xn))}{2} - \frac{f(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))}{2} - \frac{1}{2}\big(h\,(\mathrm{D}_1(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn))) + \mathrm{D}_2(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))\,(-\mathrm{D}(y)(xn-h) + 2\,f(xn, y(xn))))\big) \quad (6)$$

```
> dr:=eval(subs(eq,T1));
```

$$dr := f(xn+h, y(xn+h)) - \frac{f(xn, y(xn))}{2} - \frac{f(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))}{2} - \frac{1}{2}\big(h\,(\mathrm{D}_1(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn))) + \mathrm{D}_2(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))\,(-f(xn-h, y(xn-h)) + 2\,f(xn, y(xn))))\big) \quad (7)$$

```
> subs(h=0,dr);
```

$$0 \quad (8)$$

```
> ddr:=eval(subs(eq,diff(dr,h)));
```

$$ddr := \mathrm{D}_1(f)(xn+h, y(xn+h)) + \mathrm{D}_2(f)(xn+h, y(xn+h))\,f(xn+h, y(xn+h)) - \mathrm{D}_1(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn))) - \mathrm{D}_2(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))\,(-f(xn-h, y(xn-h)) + 2\,f(xn, y(xn))) - \frac{1}{2}\big(h\,(\mathrm{D}_{1,1}(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn))) + \mathrm{D}_{1,2}(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))\,(-f(xn-h, y(xn-h)) + 2\,f(xn, y(xn))) + (\mathrm{D}_{1,2}(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn))) + \mathrm{D}_{2,2}(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))\,(-f(xn-h, y(xn-h)) + 2\,f(xn, y(xn))))\,(-f(xn-h, y(xn-h)) + 2\,f(xn, y(xn))) + \mathrm{D}_2(f)(xn+h, y(xn-h) + 2\,h\,f(xn, y(xn)))\,(\mathrm{D}_1(f)(xn-h, y(xn-h)) + \mathrm{D}_2(f)(xn-h, y(xn-h))\,f(xn-h, y(xn-h))))\big) \quad (9)$$

```
> subs(h=0,ddr);
```

$$0 \quad (10)$$

```
> d3r:=eval(subs(eq,diff(ddr,h))):
> subs(h=0,d3r);
```

$$-\frac{D_{1,1}(f)(xn, y(xn))}{2} - \frac{D_{1,2}(f)(xn, y(xn))\, f(xn, y(xn))}{2} - \frac{\left(D_{1,2}(f)(xn, y(xn)) + D_{2,2}(f)(xn, y(xn))\, f(xn, y(xn))\right) f(xn, y(xn))}{2} - \frac{D_{2}(f)(xn, y(xn))\left(D_{1}(f)(xn, y(xn)) + D_{2}(f)(xn, y(xn))\, f(xn, y(xn))\right)}{2} \tag{11}$$