```
> restart;
> with( CodeGeneration ):
> with( codegen, cost, optimize, makeproc ):

> nTerms  := 7:
> opOrder := 2*nTerms:

> #####
> ## delta and d: coefficients for scripty D0
> #####

> ## build trancendental function
> tmp := 0:
> for i from 1 by 1 to nTerms do
    tmp := tmp+genCoeff[i]*(-4*(sin(y))^2)^(i);
  end do:
> fd := subs( genCoeff=delta, 1*tmp+4*y^2 );
```

$$fd := 4\,y^{2} - 4\,\delta_1 \sin(y)^{2} + 16\,\delta_2 \sin(y)^{4} - 64\,\delta_3 \sin(y)^{6} + 256\,\delta_4 \sin(y)^{8} - 1024\,\delta_5 \sin(y)^{10} + 4096\,\delta_6 \sin(y)^{12} - 16384\,\delta_7 \sin(y)^{14} \tag{1}$$

```
> ## expand function for small parameter
> expansionfd := taylor( fd,y,opOrder );
```

$$\begin{aligned} expansionfd := {}& \left(4 - 4\,\delta_1\right) y^{2} + \left(\frac{4}{3}\,\delta_1 + 16\,\delta_2\right) y^{4} + \left(-\frac{8}{45}\,\delta_1 - \frac{32}{3}\,\delta_2 - 64\,\delta_3\right) y^{6} \\ & + \left(\frac{4}{315}\,\delta_1 + \frac{16}{5}\,\delta_2 + 64\,\delta_3 + 256\,\delta_4\right) y^{8} + \left(-\frac{8}{14175}\,\delta_1 - \frac{544}{945}\,\delta_2 - \frac{448}{15}\,\delta_3 \right. \\ & \left. - \frac{1024}{3}\,\delta_4 - 1024\,\delta_5\right) y^{10} + \left(\frac{8}{467775}\,\delta_1 + \frac{992}{14175}\,\delta_2 + \frac{8192}{945}\,\delta_3 + \frac{9728}{45}\,\delta_4 \right. \\ & \left. + \frac{5120}{3}\,\delta_5 + 4096\,\delta_6\right) y^{12} + \mathrm{O}\left(y^{14}\right) \end{aligned} \tag{2}$$

```
> ## solve the recursive series of equations for each order
> for i from 0 by 1 to nTerms-1 do
    for j from 0 by 1 to i-1 do
      delta[j]  := d[j]:
    end do;
    coeff(expansionfd,y,2*i);
    d[i] := solve( coeff(expansionfd,y,2*i)=0,delta[i] );
  end do;
```

$$0$$

$$d_0 := \delta_0$$

$$4 - 4\,\delta_1$$

$$d_1 := 1$$

$$\frac{4}{3} + 16\,\delta_2$$

$$d_2 := -\frac{1}{12}$$

$$\frac{32}{45} - 64\,\delta_3$$

$$d_3 := \frac{1}{90}$$

$$\frac{16}{35} + 256\,\delta_4$$

$$d_4 := -\frac{1}{560}$$

$$\frac{512}{1575} - 1024\,\delta_5$$

$$d_5 := \frac{1}{3150}$$

$$\frac{512}{2079} + 4096\,\delta_6$$

$$d_6 := -\frac{1}{16632} \tag{3}$$

```
> ## assign the computed solution to delta_i
> for i from 0 by 1 to nTerms-1 do
    delta[i] := d[i]:
  end do;
```

$$\delta_0 := \delta_0$$

$$\delta_1 := 1$$

$$\delta_2 := -\frac{1}{12}$$

$$\delta_3 := \frac{1}{90}$$

$$\delta_4 := -\frac{1}{560}$$

$$\delta_5 := \frac{1}{3150}$$

$$\delta_6 := -\frac{1}{16632} \tag{4}$$