

```
In[195]:= Clear["Global`*"];
```

```
d = 4;
```

```
 $\Delta = 3$ ;
```

```
Print["y =  $\eta_1^{-1/2}$ "]
```

```
n = 10;
```

```
Print["LHS = ", lhs = Normal[Series[Exp[( $\pi^2/4$ )  $y^3 (1 - y^2)^{-3/2}$ ], {y, 0, n}]]]
```

```
Print["Expanded upto  $y^n$  i.e.  $\eta_1^{-n/2}$ "]
```

```
Print["Defect expansion Coefficients = ", dec = Array[c, n -  $\Delta$  + 2, 0]]
```

```
Print["c[0] -> Zero dimension coefficient (Contribution of identity operator)"]
```

```
Print["c[1] -> First non-zero coefficient (for  $\Delta_0$   
=  $\Delta_\phi$ ), c[2] -> coefficient for  $\Delta_0 = \Delta_\phi + 1$ , and so on ..."]
```

```
F[a_] := Normal[Series[y^a Hypergeometric2F1[a/2, (a+1)/2, 1+a-(d/2), y^2], {y, 0, n}]];
```

```
Print["Conformal Blocks upto  $\Delta_0 = n$  and expanded upto  $y^n$  i.e.  $\eta_1^{-n/2} =$ ,  
cb = Prepend[Table[F[i], {i,  $\Delta$ , n}], F[0]]]
```

```
Print["RHS = ", rhs = Collect[Dot[dec, cb], x]]
```

```
s = NSolve[
```

```
Thread[Equal[CoefficientList[lhs, y][[ $\Delta + 1$  ;;]], CoefficientList[rhs, y][[ $\Delta + 1$  ;;]]]]]
```

```
y =  $\eta_1^{-1/2}$ 
```

$$\text{LHS} = 1 + \frac{\pi^2 y^3}{4} + \frac{3 \pi^2 y^5}{8} + \frac{\pi^4 y^6}{32} + \frac{15 \pi^2 y^7}{32} + \frac{3 \pi^4 y^8}{32} + \frac{1}{9} \left( \frac{315 \pi^2}{64} + \frac{3 \pi^6}{128} \right) y^9 + \frac{3 \pi^4 y^{10}}{16}$$

```
Expanded upto  $y^n$  i.e.  $\eta_1^{-n/2}$ 
```

```
Defect expansion Coefficients = {c[0], c[1], c[2], c[3], c[4], c[5], c[6], c[7], c[8]}
```

```
c[0] -> Zero dimension coefficient (Contribution of identity operator)
```

```
c[1] -> First non-zero coefficient (for
```

```
 $\Delta_0 = \Delta_\phi$ ), c[2] -> coefficient for  $\Delta_0 = \Delta_\phi + 1$ , and so on ...
```

```
Conformal Blocks upto  $\Delta_0 = n$  and expanded upto  $y^n$  i.e.  $\eta_1^{-n/2} = \left\{ 1, y^3 + \frac{3 y^5}{2} + \frac{15 y^7}{8} + \frac{35 y^9}{16}, \right.$ 
```

$$y^4 + \frac{5 y^6}{3} + \frac{35 y^8}{16} + \frac{21 y^{10}}{8}, y^5 + \frac{15 y^7}{8} + \frac{21 y^9}{8}, y^6 + \frac{21 y^8}{10} + \frac{63 y^{10}}{20}, y^7 + \frac{7 y^9}{3}, y^8 + \frac{18 y^{10}}{7}, y^9, y^{10} \}$$

$$\begin{aligned} \text{RHS} = & c[0] + \left( y^3 + \frac{3 y^5}{2} + \frac{15 y^7}{8} + \frac{35 y^9}{16} \right) c[1] + \left( y^4 + \frac{5 y^6}{3} + \frac{35 y^8}{16} + \frac{21 y^{10}}{8} \right) c[2] + \left( y^5 + \frac{15 y^7}{8} + \frac{21 y^9}{8} \right) c[3] + \\ & \left( y^6 + \frac{21 y^8}{10} + \frac{63 y^{10}}{20} \right) c[4] + \left( y^7 + \frac{7 y^9}{3} \right) c[5] + \left( y^8 + \frac{18 y^{10}}{7} \right) c[6] + y^9 c[7] + y^{10} c[8] \end{aligned}$$

```
Out[208]= { {c[1] -> 2.4674, c[2] -> 0., c[3] -> 0., c[4] -> 3.04403,  
c[5] -> 0., c[6] -> 2.73963, c[7] -> 2.50362, c[8] -> 1.63073} }
```

