

```
f = Log[Log[Log[x]]]
```

```
Log[Log[Log[x]]]
```

```
-xD[f, x, x] / f // Simplify
```

$$\frac{1 + (1 + \text{Log}[x]) \text{Log}[\text{Log}[x]]}{x \text{Log}[x]^2 \text{Log}[\text{Log}[x]]^2 \text{Log}[\text{Log}[\text{Log}[x]]]}$$

```
Y = First[y[x] /. DSolve[y''[x] + x^\alpha y[x] == 0 && y[1] == 0 && y'[1] == 1, y[x], x]]
```

$$\left(2 x^{-\frac{1}{2+\alpha} - \frac{\alpha}{2(2+\alpha)}} \left(x^{\frac{2}{2+\alpha} + \frac{\alpha}{2+\alpha}} \text{BesselJ}\left[\frac{1}{-2-\alpha}, \frac{2 x^{\frac{2+\alpha}{2}}}{2+\alpha}\right] \text{BesselJ}\left[\frac{1}{2+\alpha}, \frac{2}{2+\alpha}\right] - \right. \right. \\ \left. \left. x \text{BesselJ}\left[\frac{1}{-2-\alpha}, \frac{2}{2+\alpha}\right] \text{BesselJ}\left[\frac{1}{2+\alpha}, \frac{2 x^{\frac{2+\alpha}{2}}}{2+\alpha}\right] \right) \right) / \\ \left(\text{BesselJ}\left[-1 + \frac{1}{-2-\alpha}, \frac{2}{2+\alpha}\right] \text{BesselJ}\left[\frac{1}{2+\alpha}, \frac{2}{2+\alpha}\right] - \text{BesselJ}\left[1 + \frac{1}{-2-\alpha}, \frac{2}{2+\alpha}\right] \right. \\ \left. \text{BesselJ}\left[\frac{1}{2+\alpha}, \frac{2}{2+\alpha}\right] - \text{BesselJ}\left[\frac{1}{-2-\alpha}, \frac{2}{2+\alpha}\right] \text{BesselJ}\left[-1 + \frac{1}{2+\alpha}, \frac{2}{2+\alpha}\right] + \right. \\ \left. \text{BesselJ}\left[\frac{1}{-2-\alpha}, \frac{2}{2+\alpha}\right] \text{BesselJ}\left[1 + \frac{1}{2+\alpha}, \frac{2}{2+\alpha}\right] \right)$$

```
y[x] /. DSolve[y''[x] + x^-2 y[x] == 0 && y[1] == 0 && y'[1] == 1, y[x], x]
```

$$\left\{ \frac{2 \sqrt{x} \text{Sin}\left[\frac{1}{2} \sqrt{3} \text{Log}[x]\right]}{\sqrt{3}} \right\}$$

```
False && Rasterize[Plot3D[
```

```
  Evaluate[y[x] /. DSolve[y''[x] + x^\alpha y[x] == 0 && y[1] == 0 && y'[1] == 1, y[x], x]],
  {\alpha, -3, 0}, {x, 1, 10}
], ImageSize -> 500]
```

```
False
```

```
Evaluate[y[x] /. DSolve[y''[x] + x^-2 y[x] == 0 && y[1] == 0 && y'[1] == 1, y[x], x]]
```

$$\left\{ \frac{2 \sqrt{x} \text{Sin}\left[\frac{1}{2} \sqrt{3} \text{Log}[x]\right]}{\sqrt{3}} \right\}$$

```
Y = First[y[x] /. DSolve[y''[x] + x^\alpha y[x] == 0 && y[1] == 0 && y'[1] == 1, y[x], x]];
```

```
ListPlot3D[
```

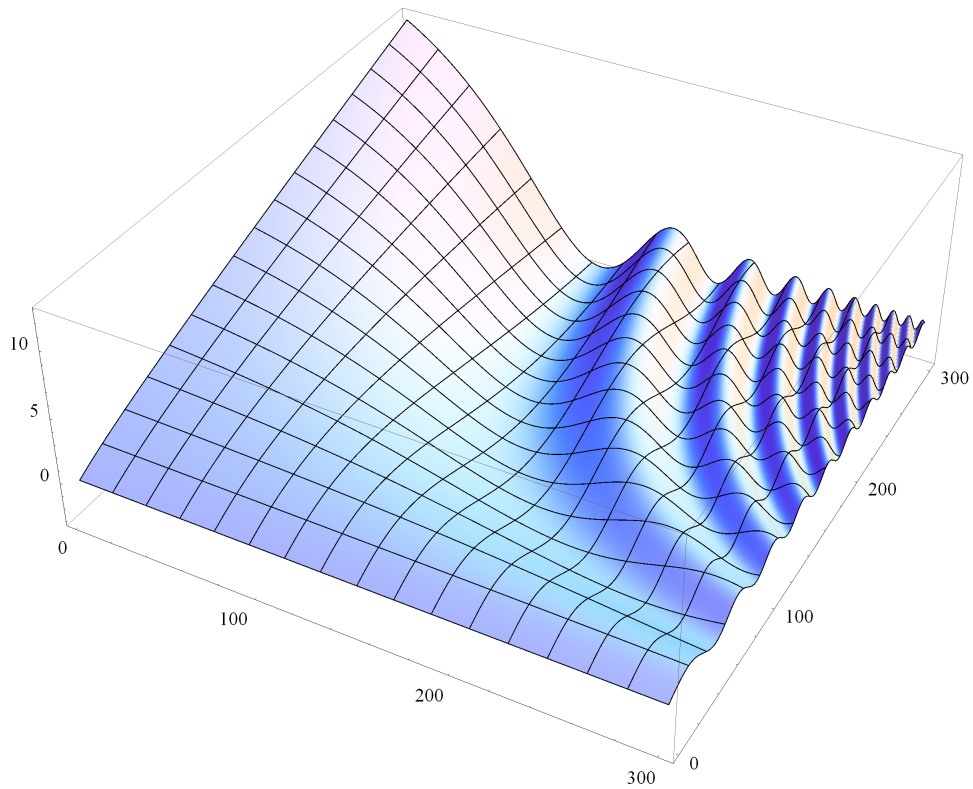
```
  Table[Y, {\alpha, -3, 1, 0.25}, {x, 1, 20, 1}],
  PlotRange -> {-5, 10}
```

```
]
```

```

Rasterize[ListPlot3D[
  Table[
    Yα = First[y[x] /.
      NDSolve[y''[x] + xα y[x] == 0 && y[1] == 0 && y'[1] == 1, y[x], {x, 1, 20}]]];
    Table[Re[Yα], {x, 1., 20, 19/300}],
    {α, -3., 1, 4/300}
  ] // Transpose
], ImageSize → 500]

```



```
Plot[Evaluate[
  Table[
    y[x] /. DSolve[y''[x] + xα y[x] == 0 && y[1] == 0 && y'[1] == 1, y[x], x],
    {α, -3, 1, 0.25}
  ]
], {x, 1, 26}]
```

