Series Solutions near an Regular Singular Point
MATH 256

Problems from Boyce and DiPrima, 7th Edition (Section 5.6)

Show that the DE has a regular singular point at $x = 0$. Find the indicial equation and its roots, as well as the recurrence relation. Then find the series solution corresponding to the larger root. Find the other solution as well if the roots do not differ by an integer.

1. $2xy'' + y' + xy = 0$

3. $xy'' + y = 0$

5. $3x^2y'' + 2xy' + x^2y = 0$

7. $xy'' + (1 - x)y' = y = 0$

9. $x^2y'' - x(x + 3)y' + (x + 3)y = 0$