231 Tutorial Sheet 16.¹²

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Useful facts:

- Euler's eqn: use $x = \exp z$.
- Series solution: assume there is a solution of the form

$$y = \sum_{n=0}^{\infty} a_n x^n$$

and, by substituting into the equation find a recursion relation: an equation relating higher terms in a_n to lower one.

• By expanding out the sum it is easy to see $y(0) = a_0$ and $y'(0) = a_1$

Questions A short problem sheet this week!

- 1. Solve $x^2y'' + 4xy' + y = 0$.
- 2. Solve $x^2y'' + 4xy' + y = x^5$.
- 3. Assuming the solution of

$$(1-x)y' + y = 0 (1)$$

has a series expansion about t = 0 work out the recursion relation. Write out the first few terms and show that the series $a_2 = 0$ so the series actually terminates to give y = A(1-x) for arbitrary A. What is the solution with y(0) = 2.

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²Including material from Chris Ford, to whom many thanks.