

Mathematical Techniques 3

Ordinary Differential Equations (ODEs)

Alston J. Misquitta

Queen Mary University of London

November 9, 2017

Read this! I

These are not lecture notes!

These slides are merely an outline/list of what we will cover in the lectures. Use them as a guide, solve the problems indicated here, and follow-up on reading the material highlighted in the reference texts.

Outline of the Talk

1 ODEs

ODEs I

We have used three sources for this topic:

- Ch. 14 & 15 from Riley, Hobson & Bence,
- Ch. 7 from Arfken, Weber & Harris (7th ed.),
- as well as the 2016 lecture notes.

ODEs II

Linear, first-order ODEs

Ch. 14 from RHB: sections 14.1, 14.2.1–14.2.4.

Here we covered exact and inexact ODEs and learned how to determine the integrating factor.

We then used examples from the 2016 lecture notes.

ODEs III

Linear, second-order ODEs

We began with Ch. 15 from RHB and worked through material till section 15.1.3. This included ways to find the complementary and particular solutions to a certain class of second-order ODE with constant coefficients.

We then used these techniques to have another look at the L–R circuit problem and the body falling in a viscous medium. We learned how to find the full solution to this particular class of ODEs.

ODEs IV

Series solutions to second-order ODEs

Here we used material from Ch. 7 of Arfken, Weber & Harris (ed. 7). Series solutions was covered in sec. 7.5, and the second-solution in sec. 7.6. These topics are also covered in the 2016 lecture notes, and we paid particular attention to the Hermite differential equation which we solved closely following the lecture notes from 2016.