2DM10 Studeerwijzer 2011–2012

Version: January 9, 2012

Algemene Informatie

Assistenten begeleide zelfstudie 2DM10 2011-2012:

- Rik Kaasschieter: e.f.kaasschieter@tue.nl
- Adrian Muntean: a.muntean@tue.nl
- Frans Martens: f.j.l.martens@tue.nl

Locatie begeleide zelfstudie 2DM10 2011-2012:

- Paviljoen U46

Verantwoordelijk docent 2DM10 2011-2012:

- Luc Florack: l.m.j.florack@tue.nl

Vervangend docent 2DM10 2011-2012, dinsdag 13-12-2011 en vrijdag 16-12-2011:

- Rik Kaasschieter: e.f.kaasschieter@tue.nl

Boek: *Calculus: A Complete Course*, Robert Adams & Christopher Essex, 7$^{\text{de}}$ editie © 2010

Studeerwijzer: `http://bmia.bmt.tue.nl/people/lflorack/Extensions/2DM10.html`

Studeerwijzer

- WC = werkcollege, HC = hoorcollege, BZ = begeleide zelfstudie
- BZ opgaven waarvoor een rekenmachine of Matlab nodig is mogen worden overgeslagen
- WC en HC hebben inhoudelijk (vrijwel) hetzelfde format van een hoorcollege
- er kunnen geen rechten ontleend worden aan deze studeerwijzer
- deze studeerwijzer zal geregeld worden aangepast gedurende de collegeperiode, controleer deze dus regelmatig

- **HC 1 15–11–2011:** ℂ-numbers and ℂ-functions, Appendices I–II
  - ℂ-basics and de Moivre's Theorem, pp. A-1–10
  - ℂ-functions in general and graphical representation, p. A-11, Fig. II.1
- **BZ 1 17–11–2011:** odd exercises Appendix II, p. A-19: 27–35
- **WC 1 18–11–2011:** ℂ-functions, Appendix II
  - definition and graphical representation of ℂ-exponential function, pp. A-15–16
  - definition and graphical representation of ℂ-monomial z^n, pp. A-11–12, Fig. II.1
  - ℂ-polynomials and Fundamental Theorem of Algebra (without proof), pp. A-16–17
  - basic algebraic manipulation (solutions to 2^{nd} order, factorization via division)

❧

- **HC 2 22–11–2011:** differentiation, chapter 2
  - standard functions and their derivatives, pp. 99–124
  - general differentiation rules, pp. 107–118
  - derivatives of standard functions
  - function (anti-)symmetrisation and definitions of sinh, cosh, and tanh, pp. 198–200
  - mathematical induction ("volledige inductie"), p. 109
- **BZ 2 24–11–2011:** foregoing BZ exercises, and
  - Appendix II, p. A-19: 17, 21
  - odd exercises 2.3, p. 114 & 2.4, p. 119 & 2.5, pp. 124–125
- **WC 2 25–11–2011:**
  - examples of mathematical induction ("volledige inductie"), p. 109
  - Rolle's Theorem, pp. 140–141

❧

- **HC 3 29–11–2011:**
  - Mean Value Theorem, pp. 136–142
  - examples of estimates via the Mean Value Theorem, pp. 136–142
  - Generalized Mean Value Theorem, pp. 141–142
- **BZ 3 01–12–2011:** foregoing BZ exercises, and
  - prove by induction: Theorem 1(c), p. 291

- odd exercises 2.8, p. 142

- **WC 3 02–12–2011:**
  - linear approximations, pp. 266–271
  - Taylor polynomials and some examples, pp. 271–279

❧

- **HC 4 06–12–2011:**
  - *proof of Taylor's Theorem, pp. 271–275*
  - big-$\mathcal{O}$ notation, pp. 276–279
  - Taylor formulas for standard functions, p. 277
- **BZ 4 08–12–2011:** foregoing BZ exercises, and
  - odd exercises 4.9, p. 271
  - prove by induction: $\frac{d^n}{dx^n}\frac{1}{1-x} = \frac{n!}{(1-x)^{n+1}}$; subsequently prove Table 5(d), p. 277
  - odd exercises 4.10, pp. 279–280
  - give the Taylor polynomials of $\sinh x$ and $\cosh x$ of order n near $x=0$, cf. pp. 198–199
- **WC 4 09–12–2011:**
  - Σ-notation, pp. 288–292
  - partitions, upper and lower Riemann sums, definite integral, pp. 299–302
  - general Riemann sums, pp. 303–304
  - properties of definite integral, pp. 305–307
  - Mean Value Theorem for definite integral, pp. 308–309
  - Fundamental Theorem of Calculus, pp. 311–315

❧

- **HC 5 13–12–2011:**
  - method of substitution, pp. 316–322
  - integration by parts, pp. 331–336
- **BZ 5 15–12–2011:** foregoing BZ exercises, and
  - exercises 5.1, pp. 292–293: 11, 13, 33, 35–38 (all via mathematical induction)
  - odd exercises 5.5 up to 45
  - exercises 5.6, pp. 323–324: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 33, 41, 43
    - hint 11: rewrite in terms of $\cosh x$ and $\sinh x$ and recall $\cosh' x = \sinh x$, $\sinh' x = \cosh x$

        * hint 19: $y = \ln \cos x$ (it is assumed that x is such that $\cos x > 0$)
        * hint 21: $x^2 + 6x + 13 = 4((\frac{1}{2}x + \frac{3}{2})^2 + 1)$

- **WC 5 16–12–2011:**
    - integral of a rational function, pp. 337–345
    - section 2.10, pp. 147–152
    - introduction to ODEs and initial value problems

❧

- **HC 6 20–12–2011:**
    - classification of ordinary differential equations (ODEs):
        * n^{th} order linear (in)homogeneous ODEs with (non)constant coefficients
        * 1^{st} order (non)linear separable ODEs
    - section 3.7, pp. 203–209 (especially cases I, II, and III)
    - section 7.9, pp. 445–453 (separable ODEs only)
    - section 17.1, pp. 938–940 (especially Theorem 1 and Theorem 2)
    - section 17.2, pp. 941–942 (separable and 1^{st} order linear ODEs only)
- **BZ 6 22–12–2011:** foregoing BZ exercises, and
    - exercises 6.1, pp. 336–337: 1, 3, 5, 7, 13, 19, 21, 37
        * hint 7: $\arctan x = 1 \cdot \arctan x$ (b.t.w. $\tan^{-1} = \arctan$)
        * hint 13: perform integration by parts twice
        * hint 19: $\cos(\ln x) = 1 \cdot \cos(\ln x)$ (it is assumed that $x > 0$)
        * hint 21: substitution of variables and integration by parts are both applicable: try!
    - exercises 2.10, p. 153: 27–45 (odd numbered only), 44
    - exercises 3.7, pp. 209–210: 13, 14, 15, 19, 21
    - exercises 7.9, pp. 452–453: 1, 3, 5, 7, 9, 13, 15, 17
- **WC 6 23–12–2011:**
    - section 17.5, pp. 957–961 (2^{nd} order only except Euler equations)
    - section 17.6, pp. 961–967 (only the method of "educated guessing" or "undetermined coefficients" for constructing particular solutions)

❧

- **HC 7 10–01–2012:**
    - section 7.9, pp. 445–453 (first order linear ODEs only)

- section 17.5, pp. 957–961 (higher order only except Euler equations)
- typical examination examples

- **BZ 7 12–01–2012:** foregoing BZ exercises, and
  - exercises 7.9, pp. 452–453: 11, 19, 21, 23
  - exercises 17.1, pp. 940–941: 1, 3, 5, 7, 9, 11, 17
  - exercises 17.5, p. 961: 1, 3, 5
  - exercises 17.6, pp. 967–968: 1, 3, 5, 7, 9
    - hint 1: stipulate a particular solution of the form $y_{\mathrm{p}}(x) = ax + b$
    - hint 3: stipulate a particular solution of the form $y_{\mathrm{p}}(x) = ae^{bx}$
    - hint 5: stipulate a particular solution of the form $y_{\mathrm{p}}(x) = ax^2 + bx + c$
    - hint 7: stipulate a particular solution of the form $y_{\mathrm{p}}(x) = (ax + b)e^{cx}$
    - hint 9: stipulate a particular solution of the form $y_{\mathrm{p}}(x) = (a \sin x + b \cos x)e^{cx}$
- **WC 7 13–01–2012:** old exams, January 19, 2011, April 13, 2011, June 30, 2011

❧

- **Exams January 25 & April 18, 2012:**
  - all theory and exercises outlined above, except subjects in *italics*
  - all theory and examples covered in the oral lectures (HC 1–7 & WC 1–7)
  - those parts of "*Calculus: A Complete Course*" relating to the above
  - only pen and paper are allowed, i.e. no calculator, laptop, notes or other material
  - it is strongly recommended to practice with old exams

❦