Part II: Integral Calculus

6. Antiderivatives & Riemann Intgrl.
↳ YES (everything in 6.)
Riemann Sum, LEIBNIZ-NEWTON etc.

7. Measurable sets & multiple integral
§ 7.1. NO
§ 7.2. YES (= Jordan Measurability)
↳ everything
§ 7.3. The multiple Integral: YES

8. Computation of multiple integrals
YES & NO → no theory questions
↳ you need it for exercises
Jacobi Matrix: YES
Polar coords: YES, spherical: NO

9. The Riemann Integral: Related topics
§ 9.1. Numerical computation of $\int_a^b f(x)\,dx$
Trapezoidal & composite trapez. rule YES
§ 9.2 Integrals & Probability: NO
Buffon needle: NO
§ 9.3. Monte-Carlo Integration: NO
& Manhattan Project

10. Extensions of the Riemann Integral
§ 10.1. Improper $\int$ ("CAUCHY") YES
§ 10.2. Testing (CONV): YES
~~Additional~~
§ 10.3. Improper $\int$ w. parameter
only Def, No Thms.

Part III: Sequences & Series

11. Series of real numbers
§ 11.1 Sequences YES (all)
§ 11.2 Series YES
especially CAUCHY's Integral Cnt'
Applications: $\sum q^n$, $\sum \frac{1}{n}$, $\sum \frac{1}{n^2}$ YES
§ 11.3. CONV Criteria / YES
additional material (Files)

12. Sequences & Series of functions
§ 12.1. Sequences of functions
Defs & Example YES
$\prod$'s (1,2,3) NO
$\prod$ 4 (WEIERSTRASS) YES (Rest: NO)
§ 12.2. Power series

13. Fourier series
§ 13.1 Recap: NO (just def.) YES
§ 13.2. Fourier Series & 13.3 Convergence:
§ 13.4. $\sum \frac{1}{n^2} = \frac{\pi}{6}$ YES
Gibbs (Idea) YES

Part I : Diff. Calculus

1. Diff. Calc for $f:[a,b] \to \mathbb{R}$ & TAYLOR

   §1.1. Limits & continuity

        ε-δ Defs   NO

        ⊤ Weierstrass   YES

   §1.2. Diff. calc. & Mean Value ⊤'s

        All ⊤'s   YES   (with geom. interpr.)

        Examples   YES

   §1.3. Taylor's Formula

        ⊤ Taylor   YES   (Proof: YES)

2. Calculus for $f: \mathbb{R}^d \to \mathbb{R}$ I

   §2.1. Geometry of $\mathbb{R}^d$ defs, etc,   YES (all)

   §2.2. Partial derivatives $-$ (———   (∇f!!!)

3. Calculus $\mathbb{R}^d$ II

      ⊤ CHAIN   YES   (HW/Proof: NO !!!)

      ⊤ Lagrange   YES   (Proof: YES)

      ⊤ Schwarz   YES

   §3.3. Fréchet diff

      Linear & Quadratic functions   YES

      Def of F-diff : NO!

4. Optimization I : Least Squares & ML

   §4.1. Optimization for $f: \mathbb{R}^d \to \mathbb{R}$

        ⊤ Fermat $\mathbb{R}^d$ YES

      ⊤ 4 & ⊤ Sylvester   YES

        Examples : YES

   §4.2. Least Squares Meth

        Formal statemen : YES

        (up to $E(a,b) = \ldots$)

        Rest : NO

   §4.3. Deep Learning: NO

5. Constraint Optimization

   §5.1. Planar curves & Implicit F Thm

        Curves: YES

      ⊤ Implicit Fct. Thm : No

   §5.2. Level sets   YES (everything)

   §5.3 The Lagrange Multiplier Meth

      ⊤ 3 YES (= Lagr. Multipl. Meth.)

      Geometric Insight : YES

      Proof : NO   (contains typo?

   $$\nabla f(x^*) = \lambda^* \nabla g(x^*))$$

      Box of minimal surface: YES

      (see also Exercises)