

Calculus III – Check List of Topics Covered

Philip Pennance

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1. Vector Geometry.
2. Reformulation of the Derivative in $\mathbb{R}$.
3. Chain Rule in $\mathbb{R}$.
4. Functions of Several Variables.
5. The Derivative of a Scalar Function.
6. Partial differentiability does not imply continuity.
7. Chain Rule for Curves.
8. The Derivative of a Vector Valued Function.
9. Example: The Electric field.
10. The Chain Rule for Vector Valued Functions.
11. Example: Conservation of Energy.
12. Example: Plane Waves.
13. General Chain Rule.
14. Equality of Partial Derivatives.
15. Differentiation under the Integral Sign.
16. Curves in a Surface. Gradient.
17. Tangent and Normal to a Curve in a Surface.
18. Line Integrals of Scalar Functions.
19. The reverse of a curve. Piecewise paths.
20. Line Integrals of Vector Fields.
21. Example: Work done by Gravitational Field.
22. Conservative Fields and Closed Paths.
23. Equivalent conditions for exactness
24. Mean Value Theorem for Integrals.
25. Partial Differential Operators.
26. Taylor in n -Dimensions.
27. Optimization without constraints.
28. Optimization with Constraints.
29. Examples: Entropy, Minimum Variance, Centroid.
30. Double Integrals.
31. Evaluation by Upper and Lower Sums.
32. Double Integrals over Different Regions.
33. Example: Center of Mass.
34. Triple Integrals over Special Regions.
35. Change of Variables Theorem
36. Polar Coordinates.
37. Cylindrical Coordinates.
38. Spherical Coordinates.
39. Green's Theorem.
40. Surface Integrals.
41. Parametrized Surfaces.
42. Divergence Theorem.
43. Stoke's Theorem and Applications.