MTH 201, MULTIVARIABLE CALCULUS AND DIFFERENTIAL EQUATIONS

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LECTURE PLAN

Text Book: Thomas' Calculus 11th Edition.

Week 1.

- Section 12.1, 12.2 (04/08/2016) .

Week 2.

- Section 12.3, 12.4 (08/08/2016).
- Section 12.5 (10/08/2016).
- Some problems from 12.5 and Section 12.6 (11/08/2016).

Week 3.

- Section 13.1 (17/08/2016).
- Section 13.3, 13.4 (18/08/2016).

Week 4.

- Section 13.4, 13.5 and some idea about a smooth curve with example (22/08/2016).
- Section 14.1, Function of several variable, interior, exterior and boundary points, Open and Closed set (24/08/2016).
- Section 14.1, 14.2 Some exercise on open and closed set and idea of continuity (25/08/2016).

Week 5.

- Section 14.2, Continuity with examples (29/08/2016).
- Section 14.3, 14.4 Partial derivatives, directional derivatives, higher order derivatives, Example of a function whose all directional derivative exist but function is not continuous. Definition of Differentiability of a function on two variables.

  For more detail see: Section 8.6, 8.7, 8.8, 8.10, 8.11, 8.12, 8.13 from Calculus 2nd Second edition by Tom M. Apostal.

  Note: For next three lectures I will follow some proofs from Apostol book and discuss section 8.6 to 8.23 (31/08/2016).
- Section 8.6 to 8.13 From Apostol Volume 2 2nd edition (01/09/2016).

Week 6.

- Statement of the Mean Value Theorem,

  Theorem (with proof): Let D be an open subset of $\mathbb{R}^2$ and $f : D \to R$ be a function . Assume that for $a \in D$ all partial derivatives $\partial f/\partial x, \partial f/\partial x$ exists and continuous on some open ball containing a point $a \in D$. Then f is differentiable at a.

  Remark: Converse is not true. Example given in class.

  Theorem (without proof): Under some assumption, $D_{xy}f = D_{yx}f$. Example where theorem fails.

  Some exercises from Apostol. (07/09/2016).
- Section $14.4, 14.5, 14.6$ Gradient vector, Chain Rule, Tangent plane and Normal line (08/09/2016).

Week 7.

- Section $14.7, 14.8$ (12/09/2016).
- Section $14.8, 14.10$ (14/09/2016).
- Some exercises from Apostol (15/09/2016).

Week 8.

- Basic introduction of double integral. Section 15.1 (26/09/2016).
- Section $11.2, 11.3, 11.4, 11.5, 11.6, 11.10$ from Apostol calculus vol 2 (28/09/2016). Integrability of function and its relationship with iterated integrals. Continuous functions are integrable and iterated integrals exist and equal.
- Section $11.10, 11.12$ From Apostol and Section $15.2, 15.3, 15.7$ from Thomas Book (29/09/2016). Change of variables formula for integration.

Week 9.

- Examples of double integrals(3/10/2016).
- Triple integrals and examples(5/10/2016).
- Line integral with respect to arc length or over a curve and mass as a line integral. Line integral of vector valued function and work as a line integral. Examples. See section 16.1, 16.2 from Thomas and 10.1 to 10.8 from Apostol (6/10/2016).

Week 10.

- Vector fields, gredient of function, flow integral, circulation, flux across a plane curve, examples(Section 16.2). Staement of fundamental theorem of line integral (section 16.3) (17/10/2016).
- Definition of connected set, path independence, conservative field, potential function, Proof of fundamental theorem of line integral. Idea of computing potential function for conservative fields, section 16.3 or Theorem 10.4 from Apostol(19/10/2016).
- Definition of simply connected set, Green's theorem (without proof). Proof will be given at end of the semester, Section 16.3 (20/10/2016).

Week 11.

- Surface integral and parametrised surface. Section 16.4,16.5 (24/10/2016).
- Stoke's theorem without proof and it's application (26/10/2016).
- Divergence and Stoke's theorem examples. (27/10/2016).

Week 12.

- Section Section 16.5 to 16.8 excercises (31/10/2016).
- Section Section 16.5 to 16.8 excercises (2/11/2016).
- Surprise Quiz (3/11/2016).

Week 13.

- First order ordinary differential equations (07/11/2016).
- First order ordinary differential equations, variables separable, homogeneous, linear and exact equations (09/11/2016).
- Variables separable, homogeneous, linear and exact equations (10/11/2016).

Week 14.

- Revision and Exercises (16/11/2016).
- Revision and Exercises (17/11/2016).

Week 15.

- Revision and Exercises (21/11/2016).
- Revision and Excersies (23/11/2016).
- Revision and Excersies (24/11/2016).

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