## Math 541 Differential Topology Spring 2015 Department of Mathematics METU

# Midterm I Content:

1. Smooth maps from a subset of Rn, diffeomorphisms;
2. Smooth manifolds, submanifolds, charts;
3. Compatible charts, Atlas, Differential structure of the class Cr
4. Manifolds with boundary, their submanifolds
5. Tangent vectors (3 definitions) differential of a smooth map;
6. Regular and critical points and values;
7. Inverse function theorem, Implicit function theorem, regular value theorem
8. Sard-Brown theorem
9. Immersion, submersion, embedding;
10. Degree of a map (in which setting it is defined): modulo 2 and integer-valued;
11. Smooth approximation theorem: absolute and relative case;
12. Isotopy of diffeomorphisms; homogeneity of manifolds;
13. Smoothing of corners;
14. Lie groups: SOn, On, Un, SUn
15. Oriented manifolds, orientation of the boundary, orientation of the preimage of a regular value; orientation of a hupersurface by a normal vectors;
16. Vector bundles, examples, sections, bundle atlas
17. Orientable vector bundles
18. Partition of unity
19. Riemannian metric (existence)
20. Transversality, preimage (intersection) theorem
21. Stability