

MATH 602D: Topics in Geometry (Fall 2022)

Description: This is a course on topics in complex geometry. The first part of the course will be an introduction to complex manifolds and holomorphic vector bundles. The second part of the course will study how objects vary along smooth families of complex manifolds. The third part of the course will focus on Calabi-Yau threefolds, and describe the process of a conifold transition, which is a tunneling mechanism in the parameter space of Calabi-Yau threefolds.

Topics:

- Complex manifolds
- Holomorphic vector bundles
- Metrics, Chern connection, and Chern curvature
- Families of complex manifolds
- Semicontinuity theorem of deformation theory
- Kodaira-Spencer theorem on stability of the Kähler property
- Calabi-Yau geometry
- Quintic threefolds
- ODP singularities and blow-up
- Calabi-Yau conifold transitions
- Jumping of the Hodge numbers
- Candelas-de la Ossa metrics
- Fu-Li-Yau geometry

Prerequisites: MATH 525: Differential Geometry I.

Meeting Time:

- MWF 10-11am in AUDX-142
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Homework: Homework will be typed or scanned and submitted on the Canvas page MATH 602D. You are encouraged to work in groups on the homework, however you must write up your own solutions.

Grading Scheme: Homework 100%
