

Final Project

A focused investigation in analytical dynamics

Professor Mark D Shattuck

Released October 19, 2026

One question. A sound model. A checked result.

The project is 20% of the course grade. It is an individual investigation, not a survey of an entire subject or a competition to produce the most pages, code, or plots.

Purpose and scope

Choose one of the six investigations in the [topic menu](#), or propose an alternative of comparable scope for instructor approval. Each topic has a starting model, a required foundation, a focused investigation, a validation requirement, and a stopping rule. The technical starting points use material already available in the course. Optional later connections are not prerequisites for beginning.

Your work may be analytical, computational, mathematical, foundational, or a combination. Establishing the foundation is necessary, but reproducing the supplied setup alone is not a complete project. The investigation must include a substantive comparison, prediction, derivation, counterexample, or other result that addresses your question.

What counts as complete?

A complete project states a focused question and its assumptions; establishes the necessary mechanics; completes the approved investigation; supports and independently checks its central result; and explains the result's meaning and limitations.

You are not required to discover a previously unknown result. A careful confirmation of expected behavior can be excellent work. A false conjecture can also lead to an excellent project when the counterexample and revised understanding are convincing. Optional extensions are *not* required for full credit.

Intellectual ownership and collaboration

Identify at least one substantial result or decision that you understand, can reproduce or verify, and can explain in your own words. This could be a derivation, a model choice, a useful comparison, a computational experiment, or a carefully defended interpretation.

Projects and presentations are individual. Discussion of shared foundations and methods is encouraged, but disclose substantive collaboration. Each student submits their own analysis and report. Several students may choose the same topic with meaningfully different approved questions; topics are not first-come, first-served.

Begin now, then refine

Read the common assignment and the sheet for your preferred topic. Complete its first-week task and use that work in your proposal. An alternative needs an equally concrete first task and stopping rule.

Plan for approximately **30–40 hours total**, including reading, analysis, computation where relevant, writing, and preparation. This is a scope estimate, not a time quota. Raise obstacles early so we can narrow the investigation.

Milestones

Small submissions that build the final investigation

All dates below are in 2026. Upload written work through **Brightspace by 11:59 PM, New York time** on the listed date. Checkpoint length is a guide; reuse material that will belong in the final report rather than writing separate essays.

Date	Milestone and expected product
October 19	Launch. Read the assignment, chooser, and preferred topic sheet; begin the first task.
October 28	Proposal + proof of concept , 1–2 pages. State the question, model, planned comparison, one preliminary result, validation plan, stopping rule, and anticipated tools.
November 11	Foundation checkpoint , about 1 page plus one result. Show a baseline derivation or computation, a successful check, and the main remaining obstacle.
November 23	Investigation checkpoint , 1–2 pages. Show substantive progress, the current evidence and an independent check, and any needed scope revision.
December 2	Main-result target . Central result and validation substantially complete; presentation outline prepared. No separate formal submission.
December 8	Presentation materials . Upload a PDF of slides, or prepared figures/equations for an approved board presentation.
December 9	Presentation in class : 5 minutes speaking + 2 minutes for questions. Remaining class time is for Exam III review.
December 21	Final report and supporting files . Incorporate presentation feedback and submit the contribution/tool-use statement with the report.

The proposal is a revisable research contract

A good proposal does not merely name a topic. It defines what will be compared, derived, or explained and shows that the first step works. Include an example calculation, a checked baseline output, or an explicit mechanical argument. A promise to start coding or reading is not a proof of concept.

After feedback, record the approved question and stopping rule. A justified change in method or narrowing of scope is part of research. Seek approval for a major change rather than silently replacing the investigation. Optional stretch goals remain optional.

Checkpoints are for feedback

Show enough evidence to diagnose the mechanics, not just report a percentage complete. Bring unresolved technical questions forward early. Weak initial work can be repaired; clear response to feedback counts positively. Notify the instructor promptly about missed milestones or circumstances affecting progress and arrange a recovery plan. Course accessibility and accommodation policies remain in effect.

Schedule change: Exam III is Monday, December 14, and occupies the entire class. The project presentations are on Wednesday, December 9, the next-to-last class meeting. The final written submission remains due on the last day of finals, December 21.

Final submission

A readable report and enough evidence to check it

Report format

Submit one PDF. Target **6–8 single-column pages**, including figures, with a maximum of **10 main-text pages**. References and technical appendices are additional. There is no arbitrary minimum: completeness and clarity matter more than length. Use readable type and margins; do not shrink the text to evade the page limit.

Use the supplied [report template](#) or an equivalent format. The template's section order is a guide, not a mandatory journal style. LaTeX is optional. Keep the central argument in the main report, not in an appendix or in unsubmitted code.

What the report should contain

- A title, your name, a short abstract, and a focused question with motivation.
- The model, variables, assumptions, necessary foundation, and distinction between supplied material and your investigation.
- The investigation, its central result, and an independent check appropriate to the claim.
- Physical or mathematical interpretation, limitations, references, and a contribution/tool-use statement.

A plot needs labeled axes, units where relevant, stated parameters, and a caption explaining what it establishes. An analytic result needs the assumptions under which it holds. A foundational argument needs accurate mechanics and a serious counterargument or alternative interpretation.

Supporting files and reproducibility

When computation materially supports your conclusions, also submit a ZIP with the source code, essential data or small data-generation scripts, and a short README. State the software and version, how to run the main calculation, which files reproduce the central figures, parameter choices, and any random seeds. Use relative paths; exclude credentials, large caches, virtual environments, and irrelevant output.

MATLAB or Python/NumPy is acceptable; do not implement both merely for this assignment. Symbolic tools are permitted when their results are checked and explained. A primarily analytic project need not contain artificial computation; include enough intermediate reasoning to verify its result.

Submit the report PDF separately from the supporting ZIP. Editable report source is welcome but not required.

Sources, AI assistance, and contribution

Use appropriate references for methods, claims, borrowed figures, and interpretive arguments. Verify citations before submitting them. Distinguish quotation, paraphrase, and your own analysis. Literature reading should support the project, not replace the investigation.

AI assistance is permitted. You remain responsible for the correctness, verification, interpretation, and defense of everything submitted. Include a concise statement, normally about 100–200 words, identifying significant assistance, what it influenced, how important outputs were checked, and your own main contribution. State that no generative AI was used when that is the case. Complete prompt transcripts are not required. The amount of AI use is not itself a grading category.

Assessment

Understanding, evidence, and explanation

The final project is 20% of the course grade. Its components below total 100 project points. The project presentation is *not* the separate homework board-presentation component of the course.

Component	Points
Proposal and research process	10
Report: technical foundation	20
Report: investigation and depth	20
Report: evidence and validation	15
Report: interpretation and synthesis	10
Report: written communication	5
Oral presentation and response to questions	20
Total	100

How the evidence will be judged

Process (10). A viable question, substantive checkpoints, and a thoughtful response to feedback. An initial proposal is allowed to evolve. Record important revisions rather than hiding them.

Report (70). Correct and usable mechanics; a substantive investigation beyond the foundation; validation that tests the actual claim; a clear explanation of what was learned; and readable writing, equations, and figures. See the [detailed rubric](#) for performance descriptions.

Presentation (20). A focused explanation of the question, decisive mechanics, central result, and validation, followed by informed answers. Polished slides do not substitute for understanding. Use the [presentation guide](#) and optional [planning template](#).

What is not a hidden requirement

Original research, extra topics, and optional extensions are not required for full credit. A narrower, completed, well-defended investigation can earn full marks.

A negative finding can be strong work: explain the expectation, decisive evidence, and revised understanding. An undiagnosed failed program is not a supported negative result.

Before submitting

Make sure the report answers the approved question; distinguishes assumptions, approximations, and exact results; explains at least one independent check; incorporates relevant presentation feedback; and identifies the contribution you can defend. Verify the PDF, supporting files, references, and disclosure.

Definition of done: A focused question, sound foundation, substantive investigation, trustworthy evidence, and a clear account of what the result means. There may always be more to investigate; that does not make a well-scoped project unfinished.

[Return to the package index.](#)