

ASTR 101 — Homework #4 (Lectures 11–12)

Practice problems from Solar System Architecture + Climates/Exoplanets

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! Weekly Homework + Grade Memos (15%)

Homework builds quantitative fluency and model-based reasoning. Expect multi-step problems and conceptual questions where units, assumptions, and physical interpretation matter as much as the final number. The purpose of homework is exam preparation and skill-building through consistent, high-quality practice — not busy work.

Submission workflow (two-stage)

Homework Solutions — due Monday 11:59 pm PT (Canvas)

- Must be uploaded as **one single, readable PDF** (not a photo dump).

- Organize clearly. Show your work. Label final answers.
- **No late submissions.** Instructor solutions will be posted Tuesday morning, so late work cannot be accepted.
- **Lowest homework score will be dropped** (to cover one off-week or emergency).

Self-Assessment + Reflection (“Grade Memo”) — due Wednesday 11:59 pm PT (Canvas)

- Self-assess (self-grade) your work using the homework rubric (posted on Canvas) and the posted solutions/guidance.
- Submit a brief grade memo that includes:
 - what you got right (and why),
 - what broke (and where),
 - what you learned,
 - what you will do differently next time.
- Your grade memo must also include:
 - a per-problem self-rating (1–5) with brief justification, and
 - AI and collaboration disclosure (even if “none”).
- Vague memos (e.g., “I need to study more”) will not earn full credit unless they include a specific error diagnosis and a concrete next-step habit.

How your homework is graded (Instructor 0–5 score)

I evaluate your combined submission (Monday solutions + Wednesday grade memo) and assign an overall score from 0–5. Homework is graded primarily on completion, professionalism, and learning behaviors, not just final correctness. “Professionalism” here means your work is readable, logically organized, shows steps and units, and reflects honest effort. Your grade memo is graded on the quality of your self-assessment, reflection, and evidence of growth.

 **AI Policy**

Allowed (study support):

- Clarifying your own notes or assigned readings
- Generating practice questions (not answers to assigned problems)
- Explaining concepts at a different level *for studying*

Not allowed (graded work):

- Generating or rewriting homework solutions, derivations, or explanations you submit

- Submitting AI-generated reasoning you cannot reproduce on your own

Always disclose AI use in your grade memos, even if the use was allowed.

Topics: *solar system architecture and planetary properties • climates and habitability • exoplanet detection • observational evidence and model-based inference*

Estimated time: ~4-5 hours

Posted: Tuesday, March 10, 2026

i Note

For **Homework #4 only**, the self-assessment grade memo is assigned **Wednesday, March 25, 2026** and due **Friday, March 27, 2026 at 11:59 pm PT** on Canvas.

Why this homework exists (read this)

This is not busy work. This assignment consolidates the core ideas from Lectures 11–12 and helps you connect planetary systems, climates, and exoplanet evidence.

This assignment is designed to:

- strengthen transfer across topics instead of treating each lecture as isolated,
- reinforce the Observable -> Model -> Inference workflow under mixed conditions,
- and build fluency for upcoming planetary and habitability topics.

What to do

Complete the assigned Practice Problems from the end of the following lecture readings:

- **Lecture 11: Solar System Architecture + Formation** - [Practice Problems](#)
- **Lecture 12: Climates + Exoplanets** - [Practice Problems](#)

Use the lecture pages for the full problem statements (located at the end of each lecture).

Note: This homework uses Lectures 11-12 only. No prior-lecture problem sets are reassigned.

Problems to complete

Core problems (required - do these first)

Lecture 11 - Solar System

2, 5, 9

Lecture 12 - Climates + Exoplanets

3, 5

Optional extra practice (not collected, strongly recommended)

If you want additional focused review after completing the core set:

- **Lecture 11:** 4, 6, 8, 10
 - **Lecture 12:** 2, 4, 6, 7, 9
-

How to earn full credit

1) Show your work (always)

For any problem with numbers, your solution must include:

- setup (what you're solving for)
- knowns/unknowns (what you're given)
- equations or reasoning path (why you're doing what you're doing)
- units at every step (units are not decoration — they're error-checking)
- a final answer that is clearly labeled (box/circle it)

If you only write a final number, you should **expect major point loss** even if it's correct.

2) Explain your reasoning (conceptual problems)

For conceptual questions, write in complete sentences. Aim for:

- Claim: your answer
- Evidence/Reasoning: why (use the lecture ideas)
- Optional sketch: a quick diagram is often worth 10 sentences

3) Use diagrams like a scientist

For geometry/sky problems: draw a labeled sketch (Sun–Earth–observer, horizon/zenith, tilt, angles). You don't need to be an artist — just be clear.

For this homework, show unit tracking and setup clearly on all calculation problems. For the mixed-tool prompts, state what is directly observed and what is inferred.

Collaboration and resources

- You may discuss ideas with classmates, but your write-up must be your own.
- If you worked with someone, add a short line at the top of your solution PDF: “Collaborators: ...”
- You may use your notes, the readings, and a calculator.

Pro tips (to save time and pain)

- Do one pass for setup first: write knowns, unknowns, and tool/equation choice before calculating.
- For transfer problems, label each step with the tool you are using (for example: density, equilibrium temperature, transit depth, inverse-square scaling).
- Use units as your lie detector.
- If a result feels extreme, do a quick order-of-magnitude sanity check before moving on.
- Finish required problems first, then move to the optional set in order.

Help

If you get stuck, bring at least **one specific attempt** (a diagram, your setup, where you got lost) to office hours. Struggle is normal; *productive struggle* is the point.