# Week 8 Challenge Homework

## Oscillating Systems and Damping

**Submission Details |** Submit a digital copy (PDF, jpg, etc.) to Canvas. Include solutions to the metacognitive exercise and each question. Please use the interface to associate each page of your submission with the assignment. It makes grading much easier. Please clearly indicate which question is being solved. If data is needed to complete a problem, be sure to cite the source you've acquired your data from. Typed work will not receive credit. See the course website for further details.

**Group Submissions |** You may submit a group collaboration to Canvas. Add each group member to the submission. Each group member should contribute to the work. Clearly indicate which part of the submission is written by each member (color or labels are preferable).

**Sensemaking |** You will be asked to apply sensemaking in some problems. More information about sense-making can be found on the BoxSand Sensemaking page, which is linked on the Canvas homepage.

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**Metacognitive Exercise**

Each week will feature a metacognitive exercise, followed by one or two challenge problems to solve. The metacognitive exercise will usually ask you to reflect on your solution to the previous week's challenge problems.

Review your solution to the Week 7 Challenge Homework. If you do not have a copy of it anymore, you can find it on Canvas or Gradescope, under the Week 7 Challenge Homework assignment. Also, review the solution which has been posted to the BoxSand solutions archive (click here for a link). Solutions are posted a few days after the assignment is due.

(a) What types of physical representations (diagrams) did you use in your solution to last week's challenge homework? After reviewing the provided solutions, what reflections do you have about the physical representations used in your own and the provided solutions?

(b) What are the common physical representations we have used in PH202 so far? For which types of questions is it common to use each of the types of physical representations? (hint: this might be good content to include in your "equation" sheet for the final exam) What are the corresponding analysis methods that go along with each physical representation type?

**Question 1:**

Watch the pendulum video found at (https://media.oregonstate.edu/media/t/0_5ebk2zoy) and answer the following questions.

(a) Find an equation for the angle as function of time that describes the motion of the pendulum, include damping.

(b) Use the equation to predict the position (positive or negative) and velocity (positive or negative) at t = 30 s. Explain your prediction using any combination of words, diagrams, math, etc.

(c) Complete the known values sensemaking to analyze how well you were able to predict the position.

(d) Excluding human measurement error, what could result in your predictions being off?