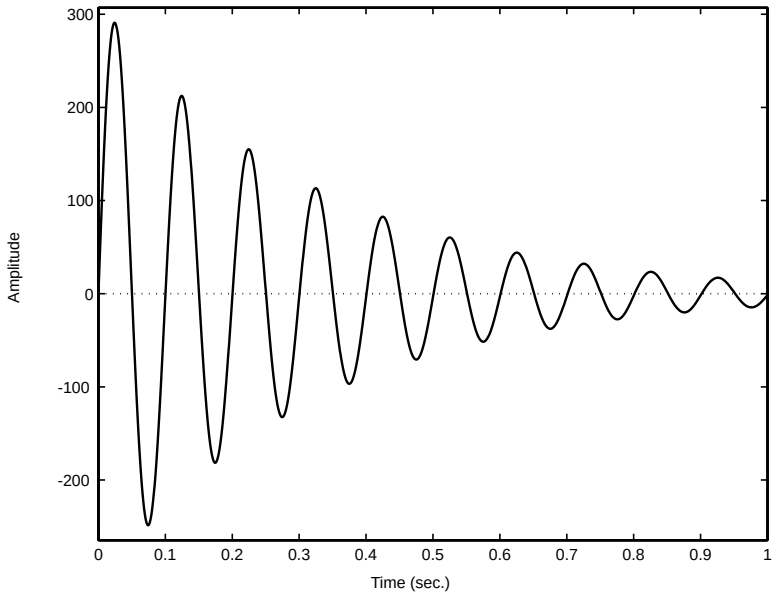
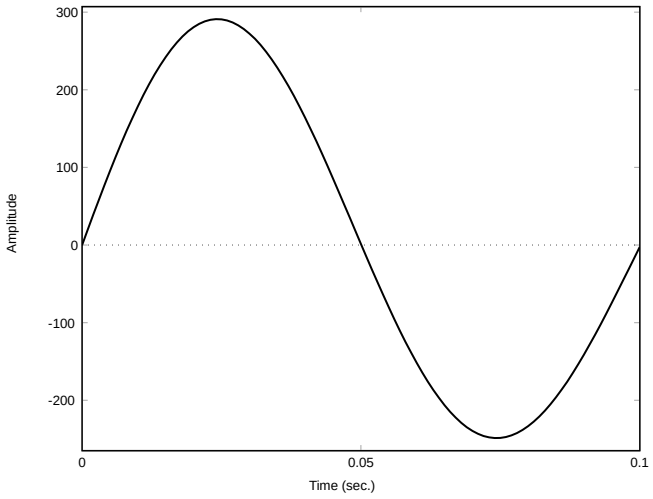
2.003 Quiz 1

This quiz has three problems. The numerical weighting of each problem is identical. The quiz is closed-book, but you may reference one page of notes (both sides) that you have prepared.

Problem 1 (20 points) This problem concerns the second-order response shown below.



We also give an expanded picture of the response near $t = 0$:



a) What are the natural frequency and damping ratio of this response? (You can work directly on the given time response plot and turn this in as part of your quiz work.)

b) Show us a mechanical system which will give this response, under the assumption that the indicated response is position in millimeters. What are possible numerical values of the system parameters and initial conditions that go with this response? Be sure to show your reasoning.