Name: _____

EE 105 Homework 1

Due in class, September 11 2019

Problem 1: Cruise control (Matlab)

This problem is intended to give you some early experience thinking about controlling things. There is not a single "right" answer, and I don't expect you to use any formal control systems techniques in your solution (we haven't learned those yet!). We'll discuss the results and strategies in class, and use these to build intuition for formal derivations later.

Your job is to develop a cruise control algorithm for a simulated car (very roughly modeled on my Subaru Impreza), by completing the function in `cruise.m`. The simulation uses a discrete-time model: at each time step, the simulator calls your function with the current and desired velocity, and your code calculates how much gas to give the car.

```
function gas = cruise(desiredSpeed, currentSpeed)
  % Your code goes here
end
```

A few things to note:

- The `simcruise` script simulates the car dynamics and produces a plot of the resulting speed. You're welcome to modify it for your own testing.
- In the simulation, the desired speed may go up and down, and the car may go up or down an incline. The existing code on lines 13-14 of `simcruise` is one example, but we'll test it against other motion profiles when grading.
- The cruise control doesn't apply the brakes, so the only way to slow down is to simply let off the gas.

What to turn in:

- Your function via `provide` (run `provide ee105 hw1 cruise.m`)
- A paragraph describing your algorithm, attached to your written work. What did you prioritize? What things did you attempt or tune to arrive at your solution? What could still be improved?

Problem 2: Some control systems

Answer the following questions for each of the example control systems below:

- What are the actuators (the things we can control)?
- What variables are measured?
- Is there "state" in the system that isn't directly measurable, and if so, what?

1. Incubator (for hatching eggs, keeping babies warm, growing bacteria, etc.)

2. Airplane autopilot

3. Coal-fired power plant

4. Multi-jointed robot arm (e.g., from KUKA or ABB. See https://www.youtube.com/watch?v=SOESSCXGhFo)