AircraftPitch_ControlFrequency

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```
In [1]: import sympy
        from IPython.display import Latex, Math, display
        from sympy import Poly
        from sympy.abc import s, z

        from control.matlab import *

In [2]: %pylab %matplotlib inline

UsageError: unrecognized arguments: inline
```

1 Aircraft Pitch: Frequency Domain Methods for Controller Design

From the main problem, the open-loop transfer function for the aircraft pitch dynamics is

$$P(s) = \frac{\Theta(s)}{\Delta(s)} = \frac{1.151s + 0.1774}{s^3 + 0.739s^2 + 0.921s}$$

where the input is elevator deflection angle δ and the output is the aircraft pitch angle θ. For the original problem setup and the derivation of the above transfer function please refer to the Aircraft Pitch: System Modeling page For a step reference of 0.2 radians, the design criteria are the following. * Overshoot less than 10 * Rise time less than 2 seconds * Settling time less than 10 seconds * Steady-state error less than 2

1.1 Open-loop response

Let's first begin by examining the behavior of the open-loop plant. Specifically, create a new m-file, and enter the following commands. Note the scaling of the step response by 0.2 to account for the fact that the input is a step of 0.2 radians (11 degrees). Running this m-file in the MATLAB command window should give you the step response plot shown below.

```
In [3]: # Helper Functions
        def tex(eqn):
            # Quick way to display a symbolic equation.
            display(Math(sympy.latex(eqn)))
```