# Chapter 7 HW Hints

**NOTE:** The MATLAB function

```
Y = polyval(P,X)
```

is useful for evaluating polynomials like the ones used in this homework.

- Parameter `P` is the vector of polynomial coefficients, *but it is arranged from high-order to low-order*, so for our cubic coefficients `a0, a1, a2, a3` one would have

```
>> P = [a3 a2 a1 a0];     % Vector of polynomial coefficients (can be row or column)
```

- Parameter `X` is the time vector (evaluation times). Given time step `dt` and final time `tf` one might use

```
>> t = [0:dt:tf];     % Vector of evaluation times (can be row or column)
```

- Then to construct the (position) trajectory you can use

```
>> pos = polyval(P,t);     % Evaluate the polynomial
```

This is a little simpler than using the coefficients separately. Of course when evaluating velocity and acceleration you have to use the coefficients of *those* polynomials.

**Problem 7.2.** This should be simple application of a cubic polynomial trajectory in a rest-to-rest motion. Use `MATLAB` to plot the position, velocity, and acceleration *vs* time.

**Problem 7.6.** ***NOTE:*** I would like to change the time durations of the two segments to be: $t_1 = 0.8$ sec, and $t_2 = 1.2$ sec. The total duration of 2 sec is unchanged. This makes the problem a little more "general."

This problem considers a two-segment splined motion. I would like you to do this problem in two different ways:

(a) The *first* method is to work the problem as stated, *i.e.* use the given velocity at the *via* point; this approach makes use of text equations (7.10) and (7.11) and should be straightforward. Remember the new time durations.

(b) The *second* method is to *disregard* the given *"via"* point velocity, and instead use the requirement that *acceleration must be continuous* across the *via* point (this is not true in method (a)). The analysis of the "continuous acceleration" case is described in Example 7.2, which results in text equations (7.15). **HOWEVER**, you *CANNOT* use the results of (7.15 since now $t_1 \neq t_2$. I would recommend expressing the boundary conditions in matrix-vector form, and solving for the polynomial coefficients numerically.

Again, use `MATLAB` to plot position, velocity, and acceleration *vs* time. It should be instructive to compare the two different approaches, and for that reason, I would like you to make three separate plots of position, velocity, and acceleration; with both methods (a) and (b) shown on each plot.