Assignment #2

Due Wednesday, 15 September, 2021 at the start of class.

Submit on paper or by email: `elbueler@alaska.edu`

Exercise 1.3.1 in Section 1.3. (*From the textbook,*[1] *of course.*)

Exercise 1.3.3 in Section 1.3.

Exercise 1.3.5 in Section 1.3.

Exercise 2.1.1 in Section 2.1.

Exercise 2.1.4 in Section 2.1.

P2. A polynomial fitting algorithm is explained in Section 2.1 of the textbook. As with most algorithms we learn, once you know how it works you should use the built-in form, in this case the MATLAB commands `polyfit` and `polyval`. Example 2.1.1 on pages 32–35 of the textbook show an example of using these commands, and you should make sure to check all the steps in that example before starting this exercise. Also look at the `help` result for each command. For each part below, show your MATLAB dialogue, both the inputs and the outputs. (*Make it neat and avoid clutter. Each answer is only a few lines.*)

(a) Check your answer to Exercise 2.1.1 above using `polyfit`. The key command will be `polyfit(x,y,n)`, but you must set `x`, `y`, and `n` appropriately.

(b) `polyval` evaluates a polynomial at a location or some locations. You need to already know the coefficients of the polynomial to use `polyval`. Show that you understand by using `polyval` to evaluate the polynomial in part **(a)** at $x = 1$.

(c) In fact, *plotting* an interpolating polynomial is also best done using `polyval`. To do this, assume you have the coefficients of the polynomial in an array (vector) `c`. Then you first choose a fine grid of x-values, say called `xf`, and you compute the corresponding y-values by

```
yf = polyval(c,xf);
```

(*The semicolon should make sense if you are doing this correctly, because* `xf` *and* `yf` *will be long lists of numbers that you will want to suppress.*) Use this technique to plot the polynomial computed in part **(a)**. Include both a smooth-looking plot of the polynomial and the interpolation points in one clear figure.

[1] Driscoll & Braun, *Fundamentals of Numerical Computation*, SIAM Press 2018.