

Problem X. Answer the following short coding questions.

As a baker, you have recorded the number of gingerbread houses you've built during the holiday season. The number of gingerbread houses built on a certain day is stored in the vector `houses` and the corresponding day is stored in the vector `days`. The vectors are guaranteed to be the same length.

As an **example**, your data may look something like

```
houses = [5 11 17 25 40]
```

```
days = [1 2 5 10 11]
```

Write 1-10 line of code to accomplish each of the following tasks in the provided space. You should NOT write functions, and do not hardcode for the given example.

- a. Using linear extrapolation, estimate the day at which the bakery has made approximately 55 gingerbread houses. Store your answer in the variable **A**.

```
A = interp1(houses, days, 55, 'extrap')
```

- b. Find the numerical second derivative of `houses` with respect to `days`. Store the vector of second derivatives in the variable **B**. When finding the second derivative, omit the last value in `days`.

```
first = diff(houses)./diff(days);  
B = diff(first)./diff(days(1:end-1));
```

- c. Find the highest order unique best fit polynomial for the original `houses` vs. `days` data. Then, calculate the **analytical integral** of this polynomial. Use zero as the constant of integration. Store the coefficients in the variable `coeffs`. Using this approximation, determine the total number of houses built after 31 days of business. Store your answer in the variable **C**.

```
coeffs1 = polyfit(houses, days, length(houses)-1);  
powers = length(coeffs1)+1:-1;2  
coeffs = coeffs1./powers;
```

- d. Plot the following in a 2 X 1 subplot. You may use the variables `houses`, `days`, and `A` (from part a).
1. In the top plot, plot the original data with `days` on the x-axis and `houses` on the y-axis. Use green plus signs. Plot the data point found in Part A using a red diamond. (5 points)
 2. In the bottom plot, plot a magenta square with side-length 3 with the bottom left corner at the origin. (5 points)

Write your code here: