

ECE 111 - Homework #3

Week #3: Linear Algebra. Due 8am Tuesday, February 1st
Please submit as a Word or pdf file and email to Jacob_Glower@yahoo.com with header ECE 111 HW#3

1) Solve for $\{x, y\}$

$$x + 5y = 10$$

$$x - 5y = 15$$

2) Solve for $\{x, y, z\}$

$$x + y = 5$$

$$y + 2z = 10$$

$$x + 2y + 3z = 15$$

3) Solve for $\{a, b, c, d\}$

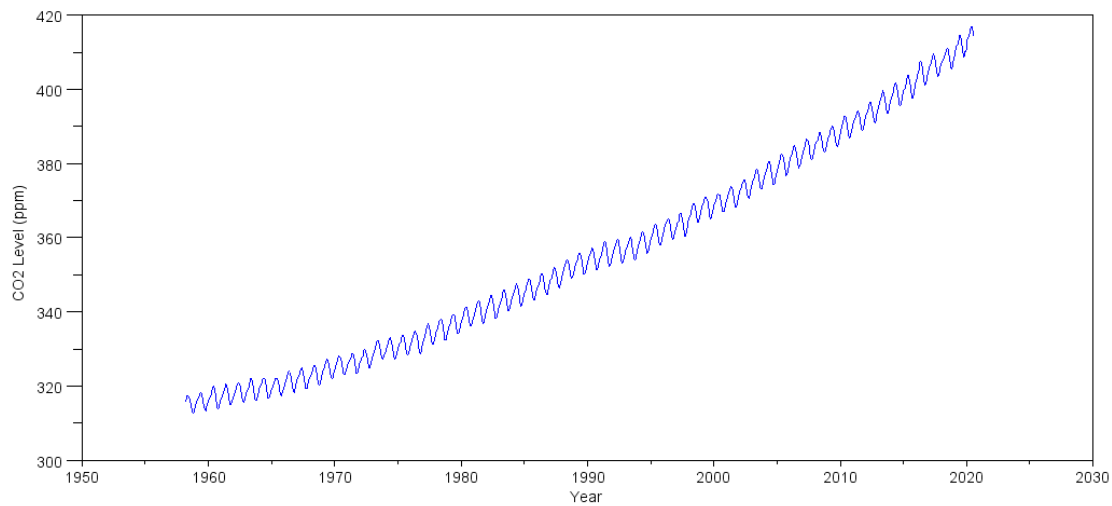
$$a - b = 0$$

$$a + b + 2c = 5$$

$$a + 2b + 3c + 4d = 10$$

$$c + d = 0$$

Problem 4-5: CO2 Levels. The CO2 levels measured at Mauna Loa observatory for the past 52 years are:



https://gml.noaa.gov/webdata/ccgg/trends/co2/co2_mm_mlo.txt
<http://www.bisonacademy.com/ECE111/Code/CO2%20Levels.txt>

Problem 4) Determine a parabolic curve fit for this data in the form of

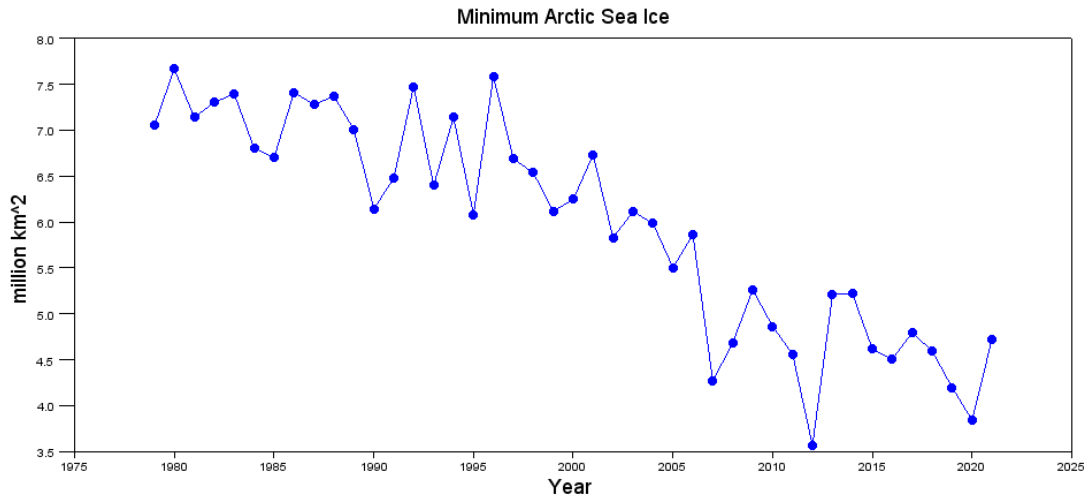
$$CO_2 \approx ay^2 + by + c$$

where 'y' is the year.

Problem 5) From this data, when do you predict that we will hit

- 400ppm?
- 2000 ppm of CO2? (the same as what was observed during the Permian extinction)

Problem 6-7) Sea Ice: The area covered by sea ice is recored by the National Snow and Ice Data Center:



<http://nsidc.org/arcticseaicenews/charctic-interactive-sea-ice-graph/>
<http://www.bisonacademy.com/ECE111/Code/SeaIce.txt>

6) Approximate this data from the years 1979 - 2021 with a line

$$Area \approx ay + b$$

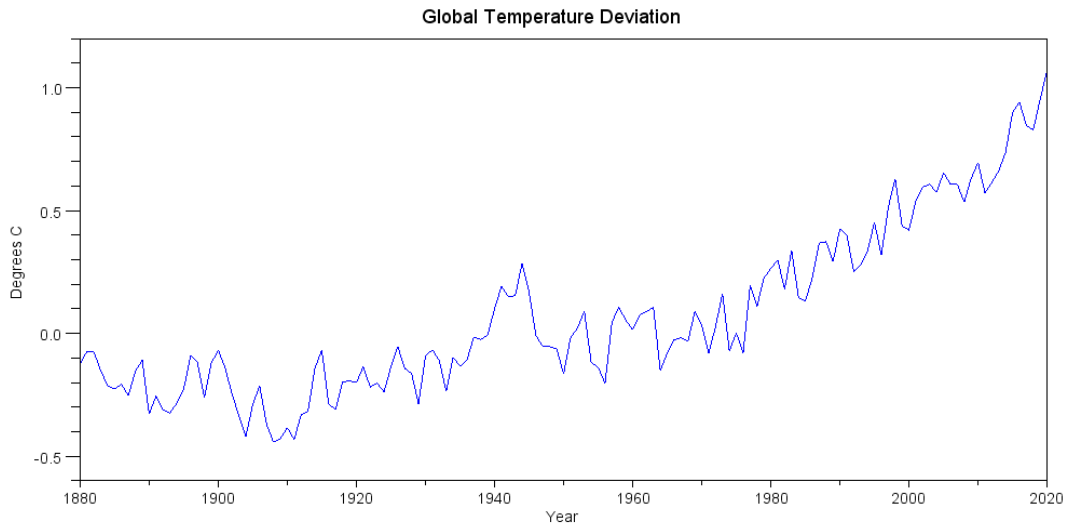
From this curve fit, when do you expect the Arctic to be ice free? (First time in 5 million years)

7) Approximate this data with a parabolic curve fit:

$$Area \approx ay^2 + by + c$$

From this curve fit, when do you expect the Arctic to be ice free?

Problem 8-9: World Temperatures. NASA Goddard has been keep records since 1880 (139 years of data).



<http://www.bisonacademy.com/ECE111/Code/Temperature%20Deviation.txt>

8a) Determine a least-squares curve fit for this data from the year 1960 - 2021 in the form of

$$\delta T = ay + b$$

Based upon this data, predict when we will see a 10 degree temperature increase if nothing changes.

8b) Determine a least-squares parabolic curve fit for this data from the year 1960 - 2021 in the form of

$$\delta T \approx ay^2 + by + c$$

Based upon this data, predict when we will see a 10 degree temperature increase if nothing changes.

9) What does a temperature rise of 10 degrees mean for the planet?