ECE 111 - Homework #3

N equations & N unknowns

1) Solve for {x, y}

$$20x + 24y = 29$$
$$5x + 15y = 11$$

2) Solve for {x, y, z}

$$4x + 17y - 18z = 1$$
$$3x + 2y - 14z = 19$$
$$-16x + 12y = 6$$
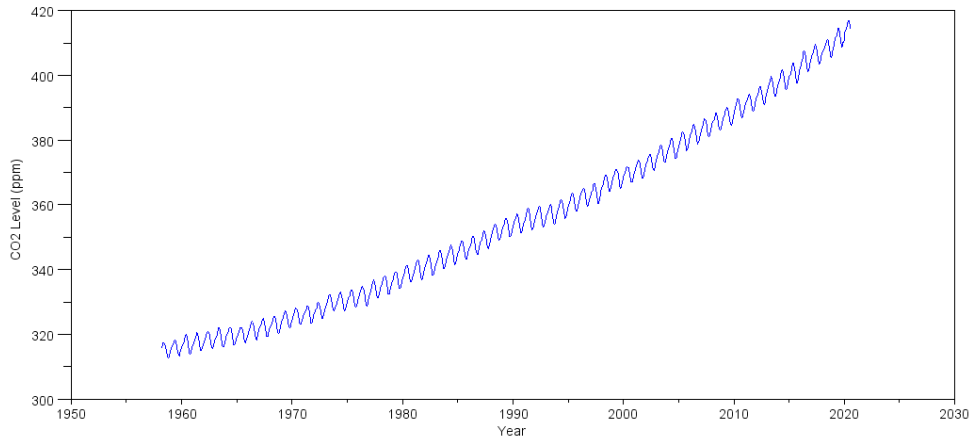
3) Solve for {a, b, c, d}

$$13a + 13b + 8c = 2$$
$$12b + 5c + 10d = 20$$
$$7a + 9b + d = 16$$
$$a + 2b + 3c + 4d = 0$$

Global CO2 Levels

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

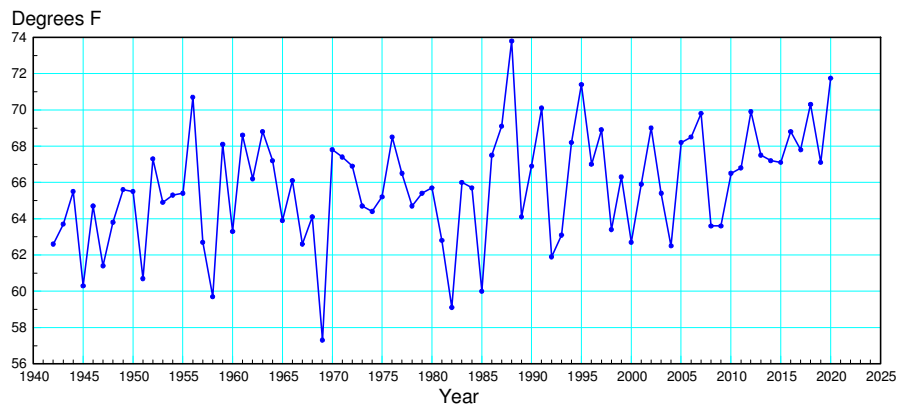**Problem 4)** Determine a parabolic curve fit for this data in the form of

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

where 'y' is the year. 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)

Fargo Temperatures

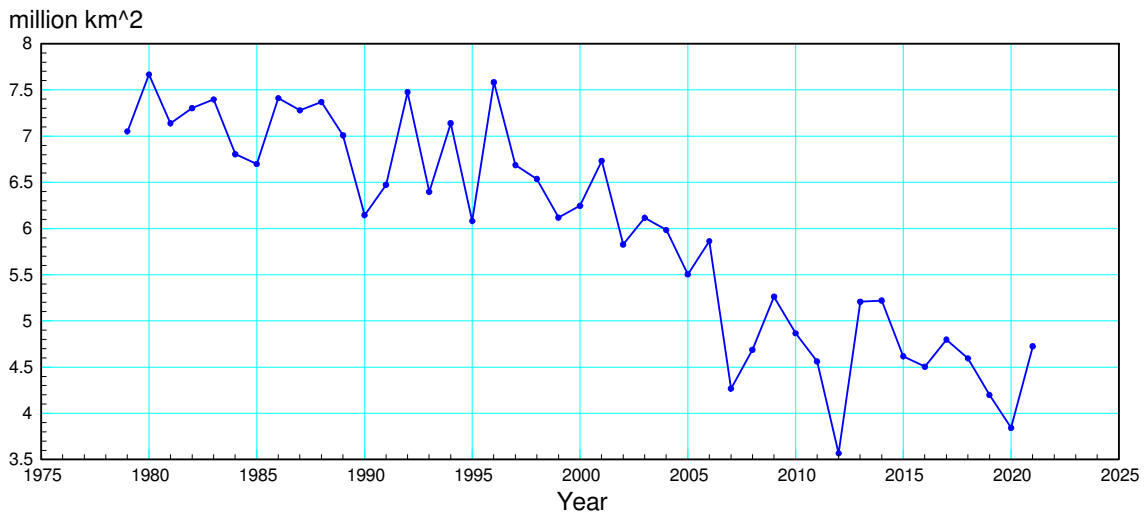5) The average temperature in June for Fargo, ND is as follows:

5a) Determine a curve fit of the form of $T = ay + b$

5b) How much has Fargo warmed up over the past 80 years?

5c) What will the average temperature in Fargo be in June in the year 2050?

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

million km^2

6) Approximate this data from the years 1979 - 2022 with a line
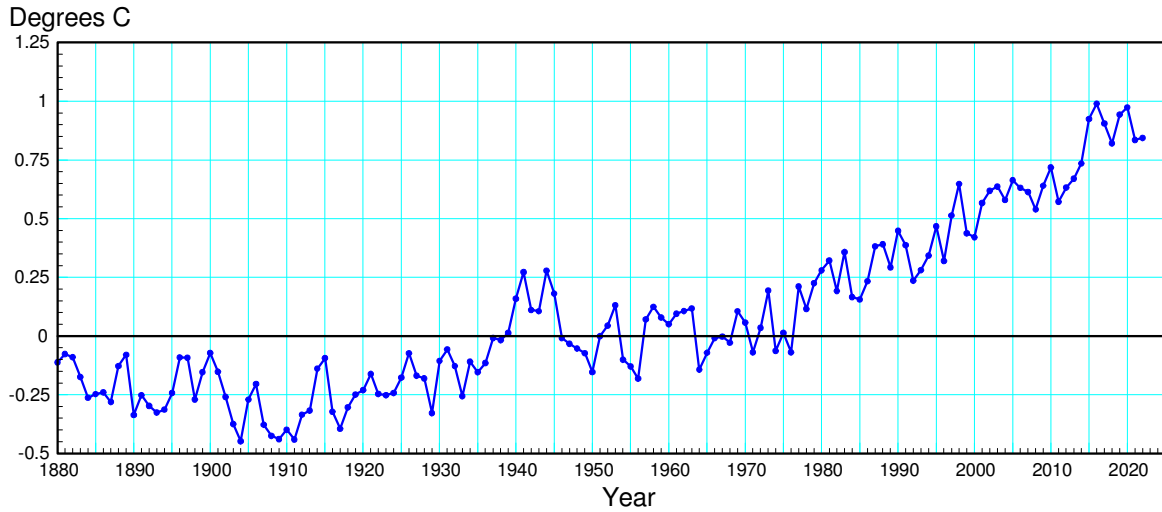
$$Area \approx ay + b$$

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).

Degrees C

Year

8) Determine a least-squares curve fit for this data from the year 1880 - 1920 in the form of

$$\delta T = ay + b$$

Based upon this data, what *should* the temperature deviation be in the year 2022?

9) Determine a least-squares curve fit for this data from the year 1965 - 2022 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?

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