Warm-up!

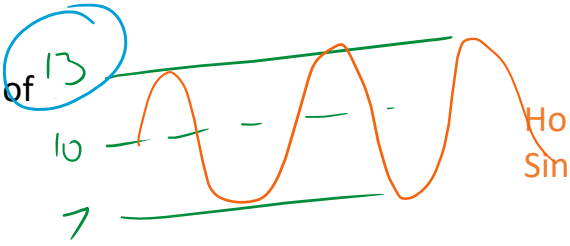
Welcome back!

Periodic Graphs Day 11:
- Sinusoidal Regression (3.7.A.4)

Homework:
Sinusoidal Regression

Test the class after next

A) What is the maximum output value of
$f(\theta) = 3\sin\left(2\theta - \frac{\pi}{3}\right) + 10$



B) What is the period of the function
$g(x) = -2\cos(8x - 4\pi) - 7$

$\frac{2\pi}{\text{Period}} = 6$

$\frac{2\pi}{6} = \text{Period}$

$\frac{2\pi}{8} = \text{Period}$

$\frac{\pi}{4} = \text{Period}$

C) Today we will be using Desmos to construct regression equations. Open Desmos on a computer. Do you remember how to enter data into a table in Desmos?

Day 11 - today
Day 12 - Review
Day 13 - Test
Day 14 - Desmos Quiz

The table below shows the highest daily temperature (in degrees F) averaged over the month for the cities of Syracuse, Washington DC, and Austin. (Table of data taken from mathbits.com)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1	2	3	4	5	6	7	8	9	10	11	12
Syracuse, NY	32	34	43	57	69	78	82	80	72	60	48	36
Washington, DC	43	47	56	67	75	84	88	87	80	68	58	47
Austin, TX	62	65	72	80	87	92	96	97	91	82	71	63

The average daily high temperature in Syracuse can be modelled by a sinusoidal function of the form $a\sin(bx+c)+d$. Use Desmos to determine suitable values of a, b, c, and d.

$$y = 25.611 \cdot \sin(0.508952x - 2.06849) + 56.87966$$

$a = 25.611$ $b = 0.509$ $c = -2.068$ $d = 56.880$

The table below shows the highest daily temperature (in degrees F) averaged over the month for the cities of Syracuse, Washington DC, and Austin. (Table of data taken from mathbits.com)

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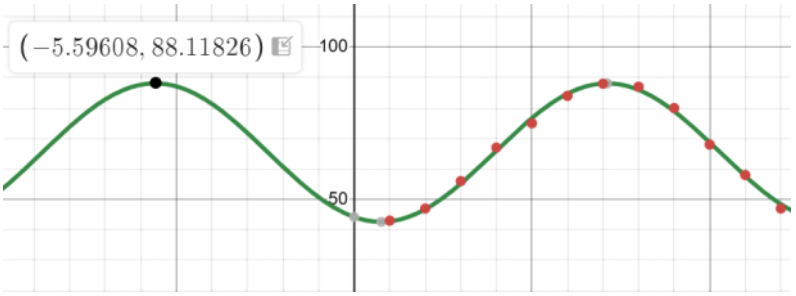
Construct a sinusoidal model of the temperature in Washington DC. According to the model, what is the maximum the average daily high reaches in that city?

88.118

$$y = 22.75042 \cdot \sin(0.494162x - 1.94702) + 65.36785$$



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Use Desmos to construct a sinusoidal model of the temperature in Austin. According to the model, what is the period with which the temperature oscillates? Is this value consistent with what one may expect given the context of the data?

$$y = 17.75775 \cdot \sin(0.503454x - 2.00468) + 79.14961$$

Period $= \frac{2\pi}{b} = \frac{2\pi}{0.503454}$

$2 \cdot \frac{\pi}{0.503454} = 12.4801576851$

Period =

$25.82216 - 13.34199 = 12.48017$

The temperature throughout the day can be modelled by a periodic function. Below is data on temperature taken from the roof of Cypress Bay HS on November 8th, 2023. t is given in hours after midnight and $Temp$ is given in °F

t	1	3	5	7	9	11	13	15	17	19
$Temp$	75	75	73	71	80	83	83	81	79	78

Use Desmos to plot this data and determine if it appears sinusoidal.

Assume the temperature can be modelled by a sinusoidal function $f(t) = a\sin(bx + c) + d$. Use a graphing utility to find suitable values of a, b, c, and d.

$y = 5.19802 \cdot \sin(0.344839x - 3.07511) + 77.96935$

What is the period of the temperature model? Does this align with what one may expect from the context of the question?

18.220 hours → No

Use the model to predict what time the temperature first reached 78°F.

$t = 8.935$ → Approximately 9 hours after midnight ↓ 9AM