Lesson #5.5: Making Connections and Instantaneous Rate of Change

Month	Temperature (°C)
1	–11.7
2	–8.7
3	–5.4
4	–1.3
5	2.5
6	6.3
7	8.0
8	7.4
9	3.5
10	–0.4
11	–4.9
12	–10.0

Example #1: The variations in mean daily minimum temperatures for Fernie, British Columbia, a ski area in the interior of B.C., from January 1 to December 31, are shown.

$per = \frac{2\pi}{k}$

$\boxed{k = \frac{2\pi}{per} = \frac{\pi}{6}}$

$amp = 9.85$

a) Write a sine function to model the data.

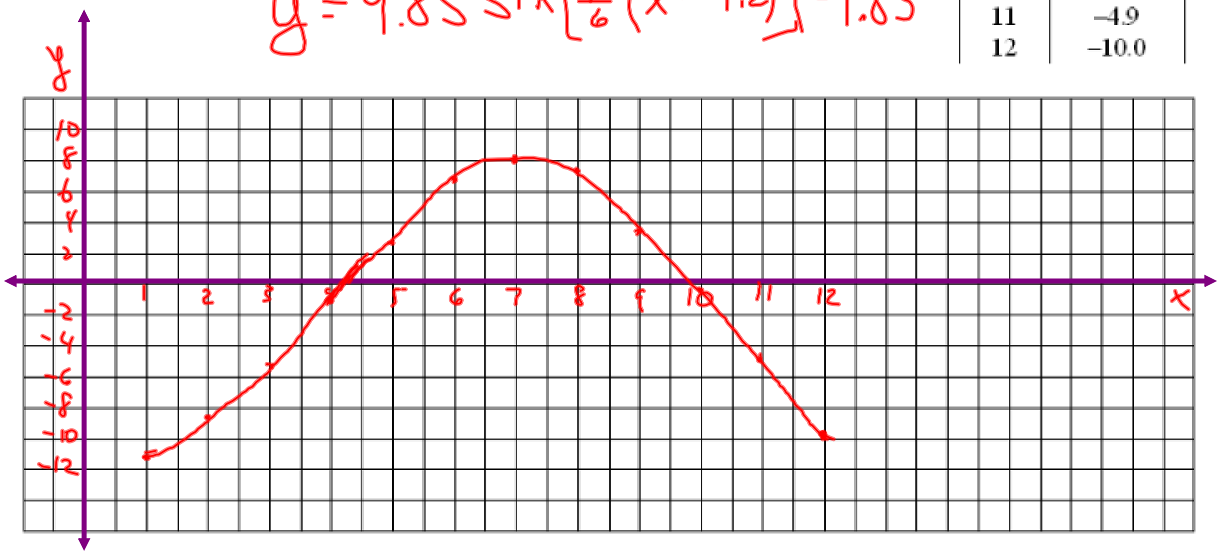
period ⇒ 12 month

vert. shift ⇒ $\frac{8-11.7}{2} = -1.85$

pS ⇒ from graph about 4.2

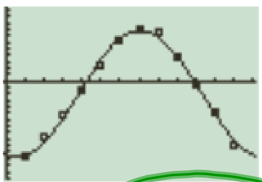
b) Make a scatter plot of the data. Then, graph the model on the same set of axes. How well does the curve fit the data in the scatter plot?

$y = 9.85\sin\left[\frac{\pi}{6}(x-4.2)\right] - 1.85$



c) Check your model using a sinusoidal regression using technology. How does the regression equation compare with the model?

```
SinReg
 y=a*sin(bx+c)+d
 a=9.747897064
 b=.4854820931
 c=-1.856023496
 d=-1.96749194
```



d) Describe what you would do if instead of using a sine function as your model you used a cosine function to model the data.

$y = 9.85\cos\left[\frac{\pi}{6}(x-7.2)\right] - 1.85$

$+4.8$

e) Estimate the rate of change of the daily minimum temperature on October 1.

−4.684

The temperature on Oct 1 is decreasing at a rate of −4.684 °C/~~day~~ month.

Homework: pg 296; #1 – 4, 6, 7, 10

x	Δx	Δy	$\frac{\Delta y}{\Delta x}$
$9 \to 10$	1	-4.34	-4.34
$9.5 \to 10$	0.5	-2.27	-4.55
$9.9 \to 10$			-4.666
$9.99 \to 10$			-4.682
$9.999 \to 10$			-4.684
$9.9999 \to 10$			-4.684