

SWBAT analyze real-life situations to create trigonometric functions and graph them on the coordinate plane.

Events that are cyclic, such as seasonal variations in temperature, can be modeled with trigonometric functions.

Example: The average temperature for Regina is hottest at 27°C on July 28, and coolest at -16°C on January 10.

- Write the cosine equation for the graph.
- Draw the graph that approximates the temperature curve for the year.
- What is the average temperature expected for October 4?
- The average temperature is higher than 23°C for how many days?

a) Whenever there are questions that deal with values over an entire year, the period is 365.

a-value: $\frac{27 - (-16)}{2} = 21.5$

b-value: $\frac{2\pi}{365}$ period = 365

c-value: We are starting the graph on January 1, so that is day zero. The maximum value (where the positive cosine graph would begin) is on July 28. So, the number of days to July 28 is:

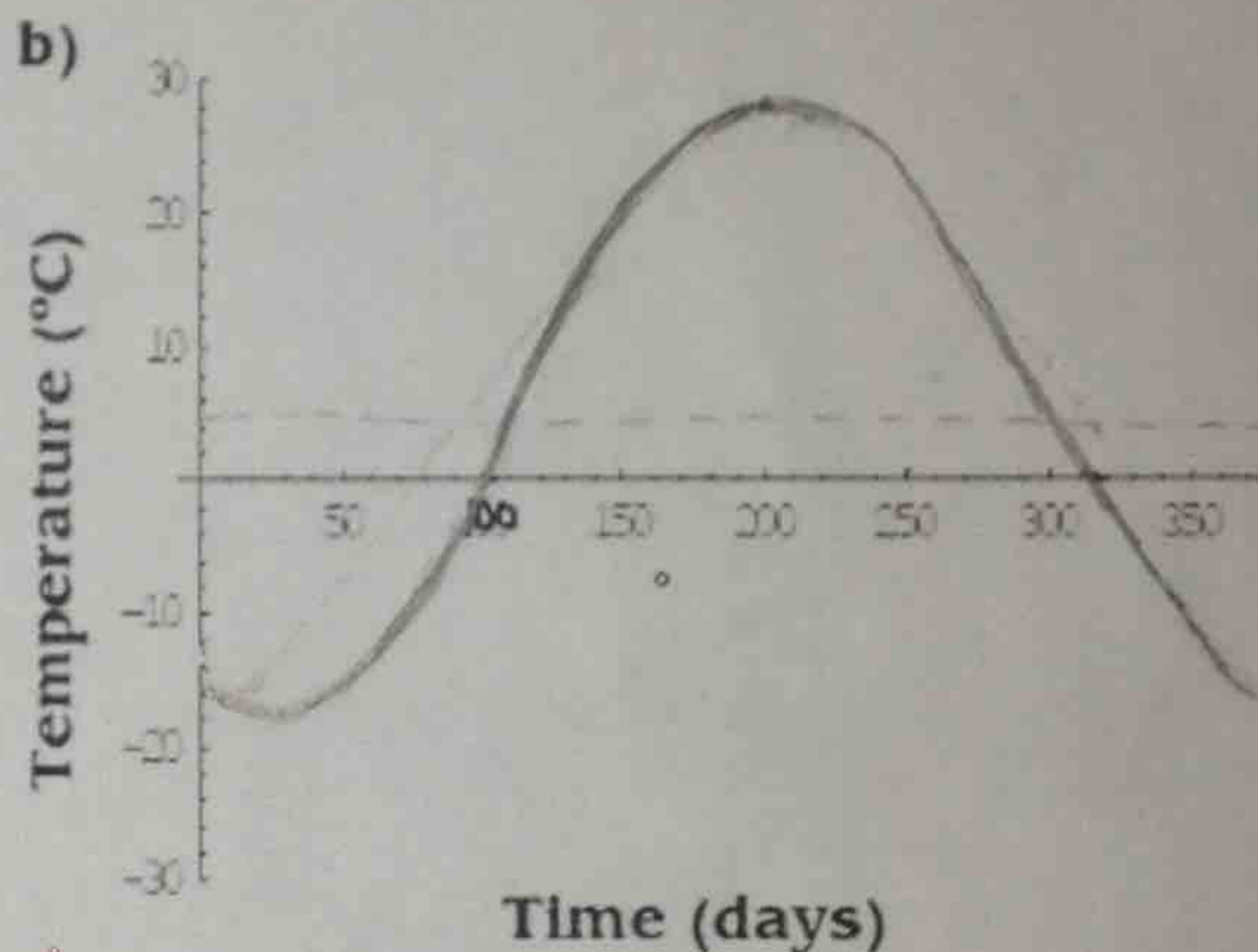
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$$31 + 28 + 31 + 30 + 31 + 30 + 28 = 209$$

d-value: midline = $\frac{27 + (-16)}{2} = 5.5$

Equation of the Average Temp is:

$$y = 21.5 \cos \frac{2\pi}{365} (\theta - 209) + 5.5$$

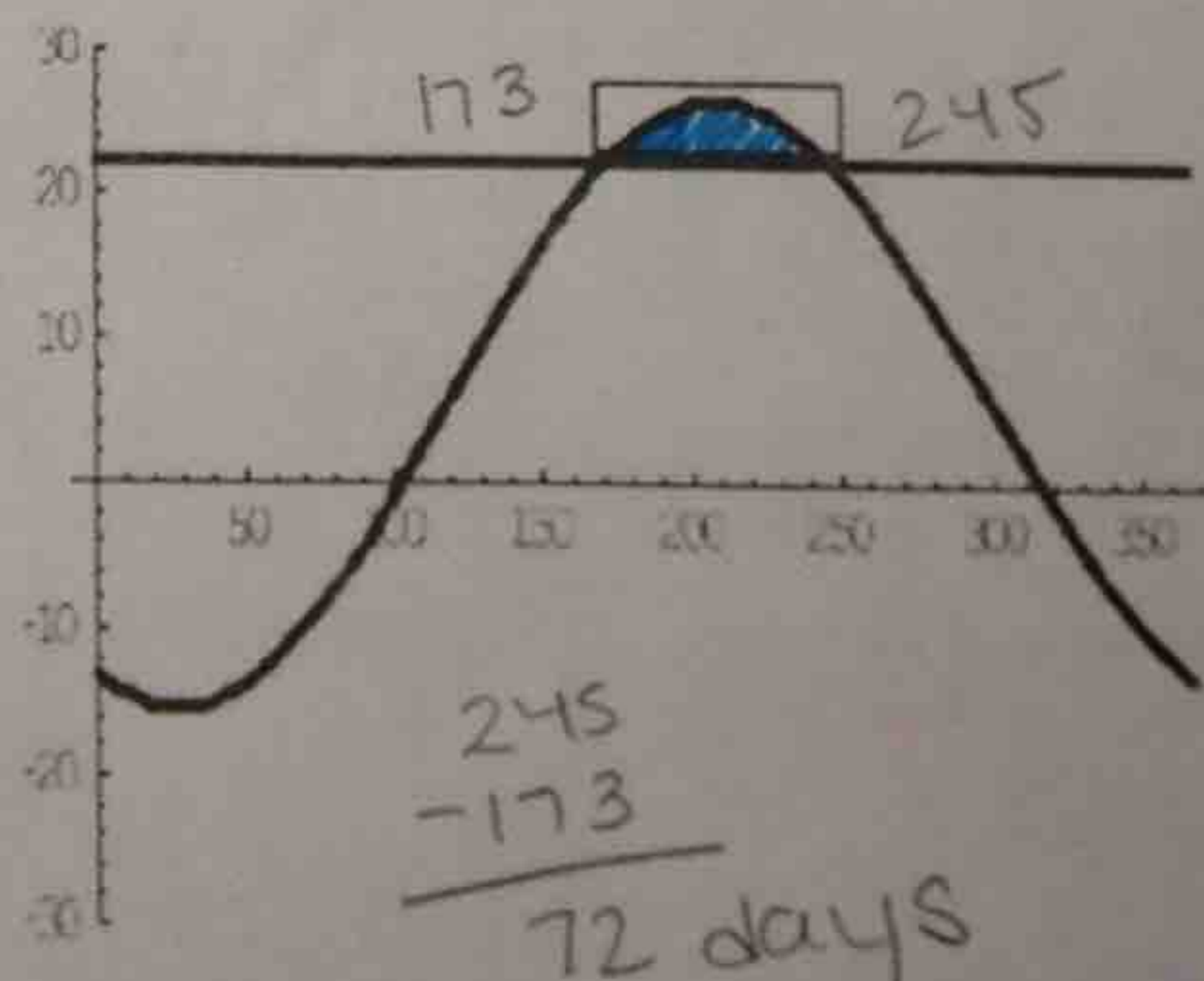


c) To find the expected temperature on October 4, first find what day of the year it is.

$$181 + 31 + 31 + 30 + 4 = 227$$

$$13.87^{\circ}\text{C}$$

d) Use your TI-83 to find the intersection points of the graph and the line $y=23$.



1. The highest average temperature for the Edmonton region is 24°C , and occurs on July 20. The coldest average temperature is -16°C , and occurs on January 14.

a) Write a cosine equation for the graph.

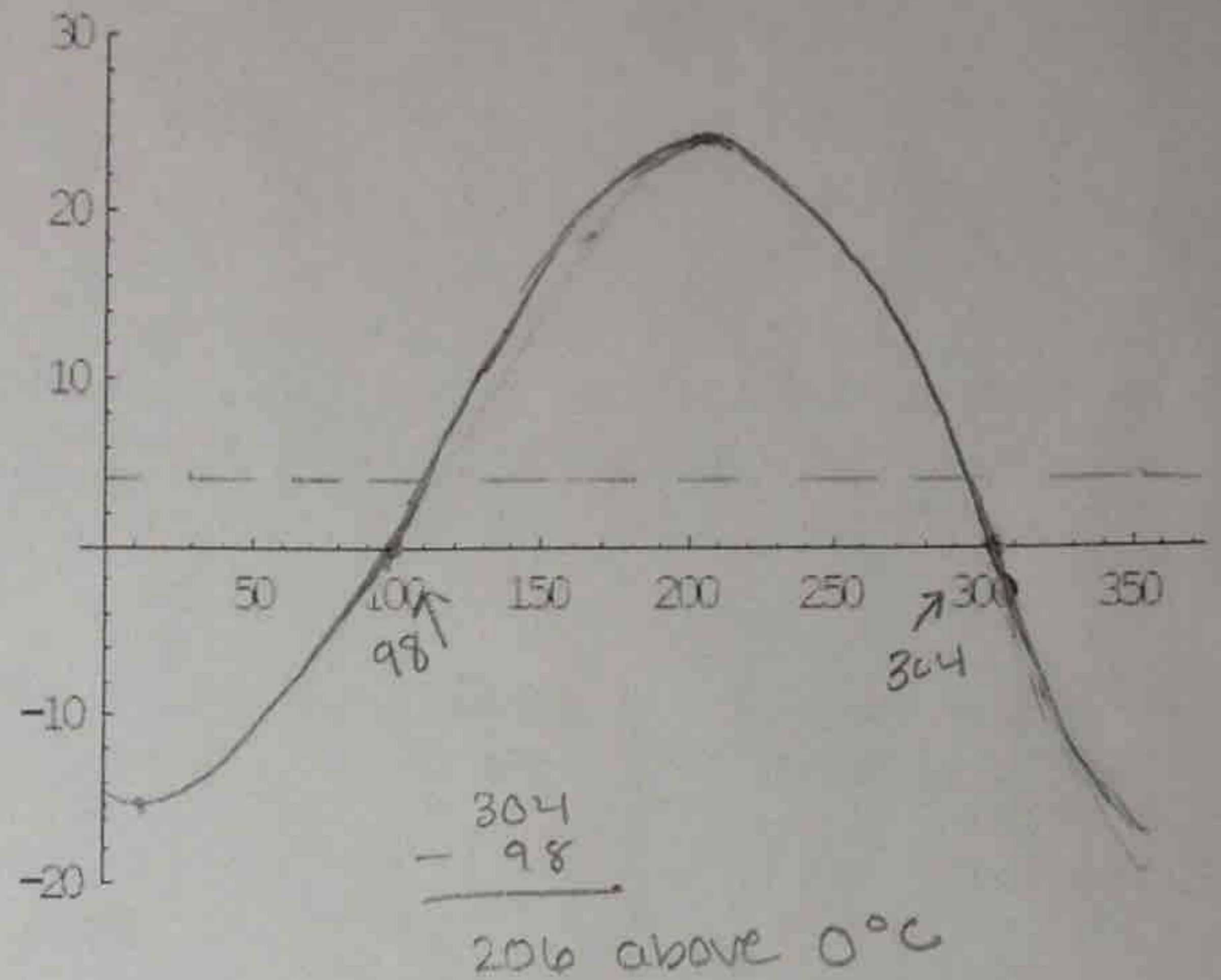
$$\text{amp} = \frac{24 - (-16)}{2} = 20$$

$$b = \frac{2\pi}{365}$$

$$y = 20 \cos \frac{2\pi}{365} (x - 201) + 4$$

$$h = 201$$

$$K (\text{midline}) = \frac{24 + (-16)}{2} = 4$$



b) Draw the graph that approximates the temperature curve for the year.

c) What is the average temperature expected for November 4? $x = 308$

$$y = -1.4^{\circ}\text{C}$$

d) The average temperature is below 0°C for how many days?

$$\frac{365 - 206}{2} = 159$$

159 days

2. The following table gives the average recorded monthly temperature throughout the year.

(Use month number for the x-axis. eg. April is $x = 4$).

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Temp	-17	-16	-9	1	10	16	22	20	15	11	2	-11

a) What is the amplitude (Based on coldest & warmest months) and period of the function?

$$\frac{22 - (-17)}{2} = 19.5$$

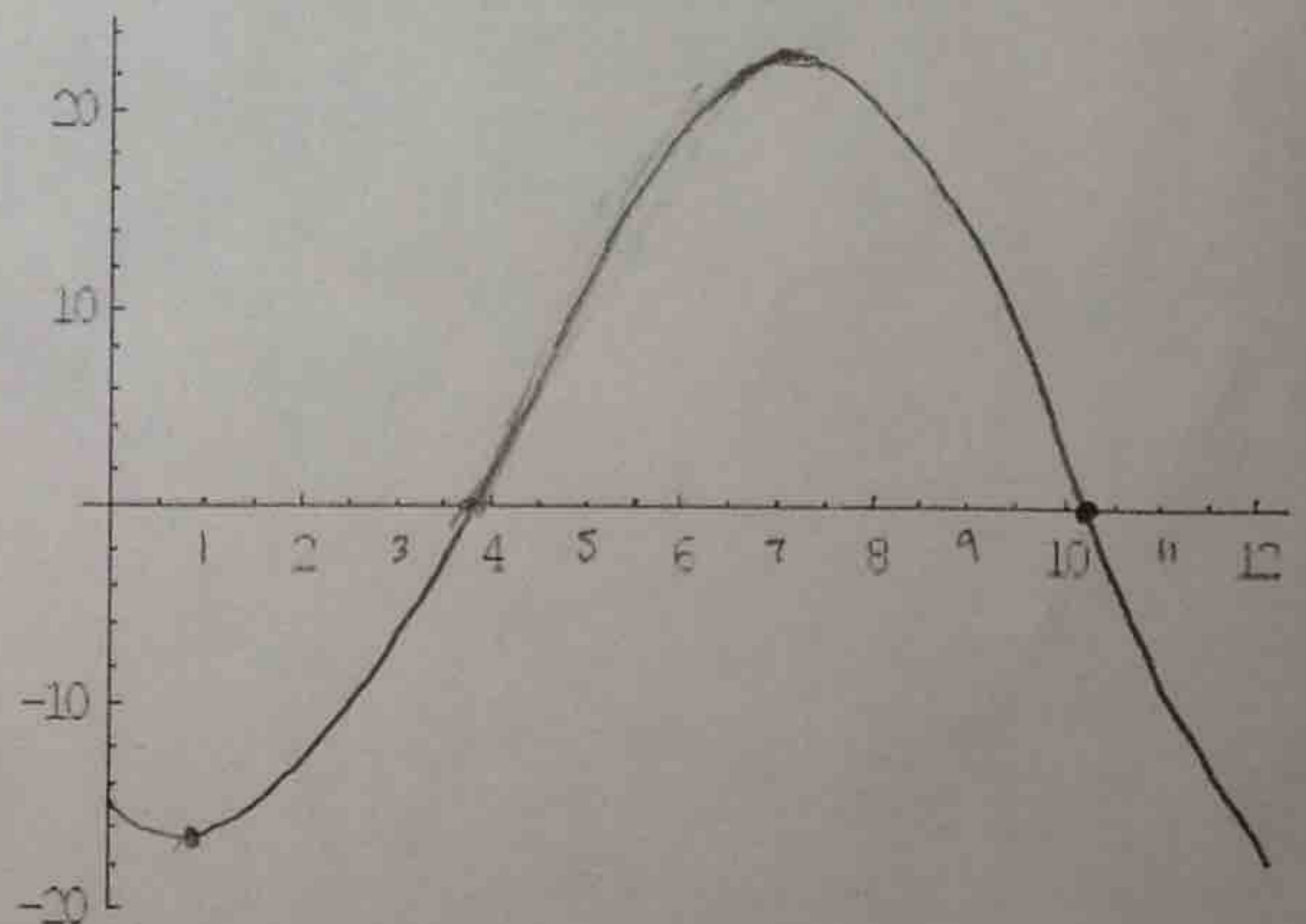
b) Write a cosine equation for the graph.

$$b = \frac{2\pi}{12} = \frac{\pi}{6}$$

$$h = 7 (\text{month, not day})$$

$$k = \frac{22 + (-17)}{2} = 2.5$$

$$y = 19.5 \cos \frac{\pi}{6} (\theta - 7) + 2.5$$



c) Sketch the graph that approximates the temperature curve for the year.

d) How does the recorded temperature for September compare with the value from your equation?

$$\text{sept} = 12.25 \text{ in calc.}$$

slightly off from recorded temp b/c we only used the max/min to make the equation