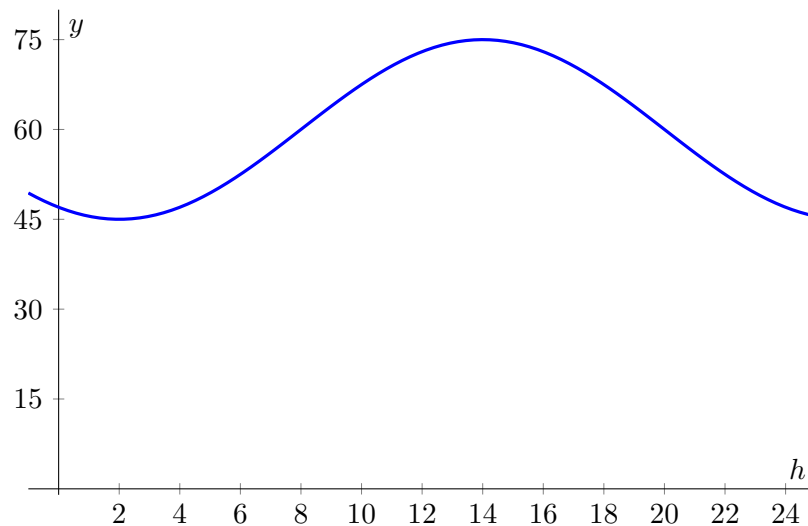


3. [13 points] Jada remembers from her time in Dreamland that the temperature was very consistent every day: It would increase from a low of 45° Fahrenheit at 2 am to a high of 75° Fahrenheit at 2 pm. The temperature, in degrees Fahrenheit, h hours after midnight could be modeled by a sinusoidal function $T(h)$. Dreamland days are 24 hours.
- a. [4 points] On the axes below, sketch a graph of $y = T(h)$, showing at least one full period. *Clearly label the axes and important points on your graph. Be very careful with the shape and key features of your graph.*



- b. [5 points] Find a sinusoidal formula for $T(h)$. You do not need to show work.

Answer: $T(h) = \underline{\hspace{1.5cm} -15 \cos\left(\frac{2\pi}{24}(h - 2)\right) + 60 \hspace{1.5cm}}$

- c. [4 points] Jada's elf friend, Alf, ran an apple stand, and found that the length of the line for his stand, in meters, could be modeled by an invertible function $g(F)$, where F is the current temperature in degrees Fahrenheit. Interpret the meaning of the following mathematical expressions or equations, or explain why they don't make sense in the context of the problem.

(i) $g^{-1}(20)$

Solution: $g^{-1}(20)$ is the temperature, in degrees Fahrenheit, when the line is 20 meters long.

(ii) $g(T(14)) = 8$.

Solution: At 2 pm, the line for Alf's apple stand is 8 meters long.