2. [6 points] You are an intern at A&B, Alice & Bob Inc. It’s the year 2055, and you’re headed to Mars to help the newest A&B store, which will open there on January 1\textsuperscript{st}, 2056.

a. [3 points] The daily sales of space suits, in thousands, at the new store \(d\) Earth days after it opens can be modeled by the sinusoidal function

\[
S(d) = 16 \sin \left( \frac{2\pi}{687} \cdot d \right) + 17.
\]

i. The function \(S(d)\) has a period of one Mars year. Use this information to find the length of a Mars year in units of Earth days.

**Answer:** One Mars year is \(687\) Earth days.

ii. According to this model, what are the minimum and maximum daily sales, in thousands, of A&B space suits on Mars?

minimum sales of \(1\) thousand suits

maximum sales of \(33\) thousand suits

b. [3 points] The daily sales of space boots, in thousands, at the new store \(m\) Mars days after it opens can be modeled by a different sinusoidal function \(B(m)\), which also has a period of one Mars year, which is 670 Mars days. The graph of \(B(m)\) is given below. Note that a maximum occurs at \(m = 0\).

![Graph of B(m)](image)

The first time that daily sales of space boots equals 13,000 is \(m = 225\) Mars days after the store opens, as shown on the graph. Find the next two values of \(m\) at which daily sales of space boots will equal 13,000 according to this model. You do not need to simplify your answers.

**Solution:** We know that the period is equal to 670 and \(m = 0\) is a maximum. Therefore, using the symmetry of the graph, the next time sales will be 13,000 is

\[670 - 225 = 445.\]

To get the third time when sales are 13,000 we should just add a period to the first solution:

\[225 + 670 = 895.\]

**Answer:** \(445\) and \(895\).