6. [11 points] A company designs chambers whose interior temperature can be controlled. Their chambers come in two models: Model A and Model B.

a. [5 points] The temperature in Model A goes from its minimum temperature of $-3°$C to its maximum temperature of $15°$C and returning to its minimum temperature three times each day. The temperature of this chamber at 10 am is $15°$C. Let $A(t)$ be the temperature (in °C) inside this chamber t hours after midnight. Find a formula for $A(t)$ assuming it is a sinusoidal function.

The amplitude of $A(t)$ is $\frac{15-(-3)}{2} = 9$. The period is 8 hours and the midline is $y = \frac{15+(-3)}{2} = 6$. We know that $A(10) = 15$ a maximum value of $A(t)$. Then
$A(t) = 9\cos\left(\frac{2\pi}{8}(t-10)\right) + 6$

Answer: $A(t) =$ $9\cos\left(\frac{2\pi}{8}(t-10)\right) + 6$

b. [6 points] Let $B(t)$ be the temperature (in $°C$) inside Model B t hours after midnight, where

$$B(t) = 5 - 3\cos\left(\frac{3}{7}t + 1\right).$$

Find the two smallest positive values of t at which the temperature in the chamber is $6°$C. Your answer must be found algebraically. *Show all your work and give your answers in exact form.*

$$5 - 3\cos\left(\frac{3}{7}t+1\right) = 6 \qquad \cos\left(\frac{3}{7}t+1\right) = -\frac{1}{3}.$$

$$\frac{3}{7}t + 1 = \cos^{-1}\left(-\frac{1}{3}\right) \qquad \frac{3}{7}t + 1 = 2\pi - \cos^{-1}\left(-\frac{1}{3}\right)$$

$$t = \frac{7}{3}\left(\cos^{-1}\left(-\frac{1}{3}\right) - 1\right) \qquad t = \frac{7}{3}\left(2\pi - \cos^{-1}\left(-\frac{1}{3}\right) - 1\right)$$