4. [12 points]
   a. [7 points]

   The average temperature, \( T \), in degrees Celsius, for the city of Forks, Washington, can be modeled by the sinusoidal function \( F(m) \), where \( m \) is measured in months after January 1 (so \( m = 0 \) represents January 1). A portion of the graph of \( T = F(m) \) is shown on the right.

   Find the period, amplitude, midline, and a formula for the sinusoidal function \( F(m) \) shown above. (Include units for the period and amplitude.)

   **Period:** \( 12 \) months

   **Amplitude:** \( 6.1^\circ C \)

   **Midline:** \( T = 10.5 \)

   **Formula:** \( F(m) = -6.1 \cos\left(\frac{\pi}{6}m\right) + 10.5 \) (many possible answers)

   b. [5 points]

   Suppose the chance of significant cloud cover in Seattle on day \( t \) of the year is \( D\% \). \( D \) can be approximated by the function \( C(t) = 23 \cos(0.0172t) + 53 \). A portion of the graph of \( D = C(t) \) is shown to the right. A family in Forks wants to visit Seattle when the chance of significant cloud cover is at least 60%. Find ALL solutions to the equation \( C(t) = 60 \) for \( 0 \leq t \leq 365 \).

   For full credit, you should solve this problem algebraically and show each step clearly. Your answer(s) should either be in exact form or be accurate to at least 2 decimal places.

   **Solution:** Using the line \( D = 60 \) in the graph above, we see that there are two solutions for \( 0 \leq t \leq 365 \) (labeled \( a \) and \( b \) above). By symmetry, we see that \( b = 365 - a \).

   Solving the equation \( 23 \cos(0.0172t) + 53 = 60 \) we find \( 23 \cos(0.0172t) = 7 \) so \( \cos(0.0172t) = \frac{7}{23} \). So one solution is given by \( 0.0172t = \cos^{-1}\left(\frac{7}{23}\right) \), i.e. \( t = \frac{\cos^{-1}\left(\frac{7}{23}\right)}{0.0172} \approx 73.346 \). This is the solution \( a \) shown in the graph. So, the two solutions are \( a = \frac{\cos^{-1}\left(\frac{7}{23}\right)}{0.0172} \approx 73.346 \) and \( b = 365 - \frac{\cos^{-1}\left(\frac{7}{23}\right)}{0.0172} \approx 291.654 \).

   **Answer(s):** \( \frac{\cos^{-1}\left(\frac{7}{23}\right)}{0.0172}(\approx 73.346) \) and \( 365 - \frac{\cos^{-1}\left(\frac{7}{23}\right)}{0.0172}(\approx 291.654) \)