1. 82.62

2. (a) \( f(x) = 1 - 2e^{-3x} \).
   \[ f^{-1}(x) = -\frac{1}{3} \ln \left( \frac{1}{2}x \right) \].
   The domain of \( f \) is all real numbers, and its range is all real numbers < 1.
   The domain of \( f^{-1} \) is all real numbers < 1, and its range is all real numbers.
   (b)

   ![Graph of functions](image)

3. (a) \( x = -\frac{5}{3}t + 12, y = \frac{2}{3}t \).
   (b) \( x = -\frac{5}{3}t + 6, y = -\frac{2}{3}t + 13 \).
   (c) \( \frac{397}{17} \approx 5.57 \) seconds.

4. 3 years.

5. The trees are
   \[
   \frac{100}{\tan(78^\circ) - \tan(64^\circ)} \approx 37.67 \text{ feet apart.}
   \]

6. (a)
   \[
   A(x) = \begin{cases} 
   -0.25x^2 + 54x & \text{if } 0 \leq x \leq 48, \\
   2241 - (63 - x)^2 & \text{if } 48 < x \leq 63.
   \end{cases}
   \]
   (b) Cut should be made at \( x = 108 - 2\sqrt{1795.5} \approx 23.25 \) cm.

7. The populations will be the same in year 558.

8. (a) Height is \( 15 - 6\sqrt{3} \).
   (b) Distance =
   \[
   \sqrt{\left( 12 - 12 \cos \frac{2\pi}{3} \right)^2 + \left( 50 + 12 \sin \frac{2\pi}{3} \right)^2}.
   \]