2. [12 points] For each equation below, solve exactly for the specified variable. Show your work carefully and write your final answer on the answer blank provided.

a. [4 points] If \(5e^{2t+3} = 6\), solve for \(t\).

\[
\text{Solution:}\quad \text{Taking the natural log of both sides of the equation, we get } \ln(5e^{2t+3}) = \ln(6).
\]
Using the properties of \(\ln\), we find \(\ln(5) + (2t + 3) = \ln(6)\). We can rearrange to get \(2t = \ln(6) - \ln(5) - 3\), so that \(t = \frac{\ln(6) - \ln(5) - 3}{2}\).

\[\text{Answer:}\quad \text{The exact value of } t \text{ is } \frac{\ln(6) - \ln(5) - 3}{2} \text{ or } \frac{\ln(6/5) - 3}{2} \]

b. [4 points] If \(\ln(3^x) = \ln(2^x) + 7\), solve for \(x\).

\[
\text{Solution:}\quad \text{Using the properties of the natural logarithm, this equation can be written } x\ln(3) = x\ln(2) + 7.
\]
Collecting the \(x\) terms on one side of the equation, we find that \((\ln(3) - \ln(2))x = 7\), so that \(x = \frac{7}{\ln(3) - \ln(2)}\).

\[\text{Answer:}\quad \text{The exact value of } x \text{ is } \frac{7}{\ln(3) - \ln(2)} \text{ or } \frac{7}{\ln(3/2)}\]

c. [4 points] If \(\log(w + 1) - \log(2 - w) = 2\), solve for \(w\).

\[
\text{Solution:}\quad \text{Using the properties of log, we can rewrite this equation as } \log\left(\frac{w+1}{2-w}\right) = 2.
\]
By the definition of the logarithm (or raising 10 to the power of both sides), we get \(\frac{w+1}{2-w} = 10^2 = 100\). Clearing the denominator, we find \(w + 1 = 100(2 - w)\). Collecting all of the \(w\) terms on one side, we get \(101w = 199\), so \(w = \frac{199}{101}\).

\[\text{Answer:}\quad \text{The exact value of } w \text{ is } \frac{199}{101}\]