4. [10 points] A new drug, Lexicor, helps reduce the symptoms of the common cold. Doctors recommend to take Lexicor the moment a patient starts showing symptoms of a cold. Let

\[ T(x) = 200 - 150 \log(ax + 3) \]

be the length of time (in hours) needed for the drug to eliminate the common cold symptoms after a dose of \( x \) mg. In this problem \( a \) is a nonzero constant.

a. [2 points] According to the function \( T(x) \), how long will it take for the symptoms of the common cold to disappear, after a patient starts showing symptoms of a cold, if he does not take Lexicor? Include units.

\[ T(0) = 200 - 150 \log(a(0) + 3) = 200 - 150 \log(3) \approx 128.43 \] hours.

b. [4 points] List all the transformations, in order, that you need to apply to the graph of the function \( f(x) = 150 \log(x) \) in order to get the graph of the function \( y = T(x) \). Assume that \( 0 < a < 1 \). Make sure to write each transformation carefully.

\[ \begin{align*}
1) & \text{ Horizontal shift to the left by 3.} \\
2) & \text{ Horizontal stretch by } \frac{1}{a}. \\
3) & \text{ Reflection about the } x\text{-axis.} \\
4) & \text{ Vertical shift up by 200.}
\end{align*} \]

c. [4 points] Find the value of the constant \( a \) if the symptoms of the common cold are eliminated 25 hours after taking a dose of 300 mg of Lexicor. Your answer must be exact or include at least three decimals. Show all your work.

\[ 200 - 150 \log(300a + 3) = 25 \]
\[ -150 \log(300a + 3) = -175 \]
\[ \log(300a + 3) = \frac{175}{150} = \frac{7}{6} \]
\[ 300a + 3 = 10^{\frac{7}{6}} \]
\[ 300a = 10^{\frac{7}{6}} - 3 \]
\[ a = \frac{1}{300} \left( 10^{\frac{7}{6}} - 3 \right) \approx 0.0389. \]