Laplace Transforms

1. (4 points) Using either the definition of the Laplace transform, or linearity and the formulas already in the table on p. 139, establish the following four additional entries for the table of Laplace transforms.

\[
\begin{align*}
    f(t) &= \mathcal{L}^{-1}\{F(s)\} \\
    F(s) &= \mathcal{L}\{f(t)\} \\
    \cosh(at) &= \frac{s}{s^2 - a^2} \\
    \sinh(at) &= \frac{a}{s^2 - a^2} \\
    e^{at}\cosh(bt) &= \frac{s - a}{(s - a)^2 - b^2} \\
    e^{at}\sinh(bt) &= \frac{b}{(s - a)^2 - b^2}
\end{align*}
\]

2. (6 points) Use Laplace transforms to solve the following two initial value problems.

a. \[x'' + 6x' + 8x = 0, \quad x(0) = 1, \quad x'(0) = 2\]

b. \[x'' + 2x' + 10x = e^t, \quad x(0) = 2, \quad x'(0) = 0\]