(10 pts) 1. Consider \( f(x) = (x - 1)e^x \). WITHOUT using a graphing calculator, find
(a) The domain and zeros of \( f \).
\[ \text{Dom}(f) = (-\infty, \infty) \]
\[ f(x) = (x-1)e^x = 0 \iff x = 1 \quad (e^x > 0 \text{ for all } x) \]
(b) The intervals on which \( f \) is increasing or decreasing.
\[ f'(x) = e^x + (x-1)e^x = xe^x = 0 \iff x = 0 \]
\[ f' \quad - \quad 0 \quad + \quad \]
\[ f \text{ is decreasing on } (-\infty, 0) \]
\[ f \text{ is increasing on } (0, \infty) \]
(c) The maximum and minimum values of \( f \).
\[ f''(x) = e^x + xe^x = (x+1)e^x \]
\[ f''(0) = 1 > 0 \implies x = 0 \quad \text{a local min.} \]
\[ f(0) = -1 \]
(d) The intervals of concavity and the inflection points.
\[ f''(x) = (x+1)e^x \]
\[ f''(x) = 0 \iff x = -1 \]
\[ f'' \quad - \quad 0 \quad + \quad \]
\[ f \text{ is concave down on } (-\infty, -1) \]
\[ f \text{ is concave up on } (-1, \infty) \]
(e) Use the information from parts (a)-(d) to sketch the graph of \( f \) on the grid below.

\[
\begin{align*}
&f(0) = -1 \\
f(-1) = \frac{-2}{e} \\
f(1) = 0
\end{align*}
\]