4.7  

b) \( f(x) = e^x \Rightarrow f'(x) = e^x + e^x = e^x(x+1) \). Note that \( e^x > 0 \) for all \( x \). Thus: \( f'(x) > 0 \Leftrightarrow x+1 > 0 \Leftrightarrow x > -1 \); \( f'(x) < 0 \Leftrightarrow x+1 < 0 \Leftrightarrow x < -1 \). Function \( f \) is increasing on \((-1, \infty)\) and decreasing on \((-\infty, -1)\).

c) \( f \) changes from decreasing to increasing at its only critical number, \( x = -1 \). Thus \( f(-1) = e^{-1} \) is a local minimum value.

3.  

2(a) \( y = f(x) = x \ln x \) (Note that \( f \) is only defined for \( x > 0 \)).

\[ f'(x) = x \left( \frac{1}{x} \right) + \ln x = 1 + \ln x. \]

Thus \( f \) is increasing on \((0, e)\) and decreasing on \((e, \infty)\).