Theorem (l'Hospital's rule). *If* $\lim_{x \to a} \frac{f(x)}{g(x)}$ *has indeterminate form* $\frac{0}{0}$ *or* $\frac{\infty}{\infty}$, *then* $\boxed{\lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)}}$

1. Evaluate the limits (answer either a number, $-\infty$, ∞, or DNE).

(a) $\lim_{x \to \infty} \dfrac{\ln x}{x}$

(b) $\lim_{x \to 1} \dfrac{\ln x}{2x - 2}$

(c) $\lim_{x \to 0^+} \dfrac{\ln x}{x}$

2. Evaluate the limits (answer either a number, $-\infty$, ∞, or DNE).

(a) $\lim_{x \to \infty} \dfrac{\sinh x}{x}$

(b) $\lim_{x \to 0} \dfrac{\sinh x}{x}$

(c) $\lim_{x \to 0} \dfrac{\cosh x}{x^2}$

(d) $\lim_{x \to \infty} \dfrac{\cosh x}{x^2}$

(e) $\lim_{x \to -\infty} \dfrac{\tanh x}{x}$

3. Evaluate the limits (answer either a number, $-\infty$, ∞, or DNE).

(a) $\lim\limits_{x\to-\infty} x^2 e^x$. Hint: $x^2 e^x = \dfrac{?}{?}$.

(b) $\lim\limits_{x\to 0^+} x\ln x$. Hint: $x\ln x = \dfrac{\ln x}{?}$.

(c) $\lim\limits_{x\to 0^+} x^x$. Hint: $x^x = e^?$.