

Name: _____

Section: _____

Exercises.

1. Identify each limit below as an indeterminate form (like $0/0$, ∞/∞ , or $0 \cdot \infty$) and then use L'Hospital's Rule to evaluate the limit.

(a) $\lim_{x \rightarrow 1} \frac{\sin(x-1)}{x^2-1}$

(b) $\lim_{x \rightarrow 0^+} x^2 \ln(x)$

2. **Exponential vs. polynomial growth.** Both $f(x) = e^x$ and $P(x) = x^n$ (where n is a positive integer) grow indefinitely as x increases. In this exercise we will see that exponential growth always eventually outstrips polynomial growth.

Use L'Hospital's Rule to evaluate the limits:

(a) $\lim_{x \rightarrow \infty} \frac{x}{e^x}$

(b) $\lim_{x \rightarrow \infty} \frac{x^2}{e^x}$

(c) $\lim_{x \rightarrow \infty} \frac{x^3}{e^x}$

(d) $\lim_{x \rightarrow \infty} \frac{x^4}{e^x}$

Let n be any positive integer. What do you think $\lim_{x \rightarrow \infty} \frac{x^n}{e^x}$ is? Explain.