
L'Hospital's Rule

Solutions should show all of your work, not just a single final answer.

1. Evaluate each of the following limits.

$$(a) \lim_{x \rightarrow 0} \frac{(x+1)^{11} - 11x - 1}{x^2}$$

$$(b) \lim_{x \rightarrow 0} \frac{\sin(3x)}{e^{9x} - e^{2x}}$$

$$(c) \lim_{x \rightarrow 0} \frac{x - \tan x}{x - \sin x}$$

$$(d) \lim_{x \rightarrow \infty} \frac{\ln(2015x^2 + 1)}{\ln x}$$

$$(e) \lim_{x \rightarrow 1} \frac{x^x - x}{\ln x}$$

$$(f) \lim_{x \rightarrow 0} \frac{\ln(\cos(2x))}{\ln(\cos(3x))}$$

$$(g) \lim_{x \rightarrow \infty} \left(1 + \frac{10}{x^2}\right)^{x^2}$$

$$(h) \lim_{x \rightarrow 1} \frac{x^x - x^6}{\ln x}$$

2. What happens when try to use L'Hospital's Rule to evaluate $\lim_{x \rightarrow \infty} \frac{x}{\sqrt{x^2 + 1}}$? Explain what goes wrong, then evaluate this limit using earlier methods from the course.