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# Indeterminate Forms and l'Hospital's Rule

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

1. For each of the following limits, indicate what kind of indeterminate form it is and then evaluate it with l'Hospital's rule.

(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)  $\lim_{x \rightarrow \infty} \frac{\ln(1881x^2 + 1)}{\ln x}$

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

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

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

(h)  $\lim_{x \rightarrow 1} \frac{x^x - x^a}{\ln x}$ , where  $a$  is constant

2. Indicate what kind of indeterminate form  $\lim_{x \rightarrow \infty} \frac{x}{\sqrt{x^2 + 1}}$  is and then try to evaluate it with l'Hospital's rule. Explain what goes wrong and then evaluate this limit using methods from earlier in the course.