We have seen how L'Hôpital's Rule can be helpful with evaluating limits for which substitution leads to the indeterminate form $\frac{0}{0}$. In this lesson, we will look at dealing with other indeterminate forms.

Specifically, we will consider how we can evaluate limits when substitution gives the following indeterminate forms:

$$\frac{\infty}{\infty},\ \frac{\infty}{0},\ \infty-\infty,\ 1^{\infty},\ 0^{0},\ \infty^{0}$$

To get a sense of why above are considered indeterminate forms, consider the following two limits:

$\lim_{x\to\infty} 1^x =$ ________ $\qquad \lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x =$ ________

Notice that in each case above, we are evaluating the limit of a function of the form $h(x)=f(x)^{g(x)}$, where $\lim_{x\to\infty} f(x)=1$ and $\lim_{x\to\infty} g(x)=\infty$, yet these two limits give different results.

Example

Evaluate $\lim_{x\to\infty}\frac{\ln x}{2\sqrt{x}}$ Indeterminate Form: ☐

Example

Evaluate $\lim_{x\to\frac{\pi}{2}}\frac{\sec x}{1+\tan x}$ Indeterminate Form: ☐

Example

Evaluate $\lim_{x\to\infty}\left(x\sin\frac{1}{x}\right)$

Indeterminate Form: ☐

Example

Evaluate $\lim_{x\to 1}\left(\frac{1}{\ln x}-\frac{1}{x-1}\right)$

Indeterminate Form: ☐

Example

Evaluate $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{x}$

Indeterminate Form: ☐

Example

Evaluate $\lim_{x \to 0^+} x^x$

Indeterminate Form:

Example

Evaluate $\lim_{x \to \infty} x^{\frac{1}{x}}$

Indeterminate Form: