8.2 L'Hopital's Rule

Indeterminate forms: $\frac{0}{0}$ or $\frac{\infty}{\infty}$

$$\lim_{x\to a}\frac{f(x)}{g(x)}=\lim_{x\to a}\frac{f'(x)}{g'(x)}$$

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$$\lim_{x\to 0}\frac{\sin x}{x}$$

Graph $\frac{\sin x}{x}$ and $\frac{\cos x}{1}$

How does this support L'Hopital's rule?

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$$\lim_{x \to 1} \frac{\ln x}{x - 1}$$

$$\lim_{x \to 0} \frac{\sqrt{1 + x} - 1}{x}$$

$$\lim_{x \to \pi} \frac{\pi - x}{\sin x}$$

$$\lim_{x \to 0} \frac{4x}{x^2}$$

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$$\lim_{x \to \frac{\pi}{2}} \frac{\sec x}{1 + \tan x}$$

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Other indeterminate forms

$\infty - \infty \quad \infty \bullet 0$ change to a quotient

$$\lim_{x\to\infty} x \sin\frac{1}{x}$$

$$\lim_{x\to\frac{\pi}{2}^-} \left(\sec x - \tan x\right)$$

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Other indeterminate forms

$1^\infty \quad 0^0 \quad \infty^0$ use logs/exponential rules

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

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

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$$\lim_{x\to\infty}\left(1-\frac{3}{x}\right)^{2x}$$

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