- Test 2 is on Friday, December 2
- Today: Indeterminate forms and L'Hôpital's Rule
- Watch videos 6.10, 6.12, as well as 6.11 before next Wednesday's class.

Computations

Calculate:

1. $\lim_{x\to 2} \frac{x^2+2x-6}{x^2+3x-10}$
2. $\lim_{x\to 0} \frac{e^{2x^2}-\cos x}{x \sin x}$
3. $\lim_{x\to\infty} \frac{x^2}{e^x}$
4. $\lim_{x\to\infty} \frac{e^x+e^{-x}}{e^x-e^{-x}}$

Indeterminate?

Which of the following are indeterminate forms for limits? If any of them isn't, then what is the value of such limit?

1. $\frac{0}{0}$
2. $\frac{0}{\infty}$
3. $\frac{0}{1}$
4. $\sqrt{\infty}$
5. $\frac{\infty}{\infty}$
6. $\frac{1}{\infty}$
7. $0 \cdot \infty$
8. $\infty \cdot \infty$

More computations

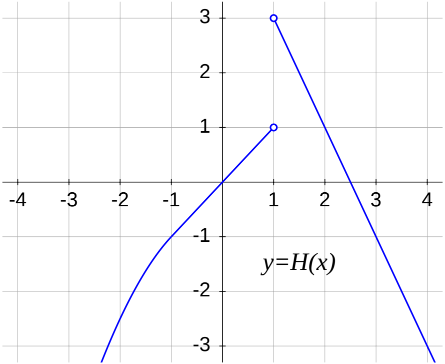
Calculate:

1. $\lim_{x\to\infty} (\sin x)\left(e^{1/x} - 1\right)$
2. $\lim_{x\to\infty} x \sin \frac{2}{x}$
3. $\lim_{x\to\infty} x \cos \frac{2}{x}$
4. $\lim_{x\to 1} \left[(\ln x) \tan \frac{\pi x}{2}\right]$

Limits from graphs

Compute:

$$\lim_{x \to 0} \frac{H(x)}{H(2+3x) - 1}$$



Sample solution of the last slide's limit

Note that $H(x)$ and $H(2+3x)-1$ are both differentiable as $x \to 0$. Moreover, $H(2+3x)-1 \neq 0$ for values of x near 0 but not equal to 0.

Also, $\lim_{x\to 0} H(x) = 0$ and $\lim_{x\to 0} (H(2+3x)-1) = 0$. Therefore, we can apply L'Hôpital's rule.

In order to do so, note that

- $H'(x) = 1$ as $x \to 0$,
- $(H(2+3x)-1)' = H'(2+3x) \cdot 3$ as $x \to 0$, and
- $H'(x) = -2$ as $x \to 2$.

Therefore, $\lim_{x\to 0} H'(x) = 1$ and $\lim_{x\to 0} (H(2+3x)-1)' = -6$. Thus

$$\lim_{x\to 0} \frac{H(x)}{H(2+3x)-1} = -\frac{1}{6}$$