

# Evaluating Limits

## Reading

- Sections 2.5

## Practice problems

- Section 2.5: 5, 7, 11, 13, 21, 24, 25
- To turn in (together with 2.6): 2.5 16, 30

## Notes

### Algebraic Evaluation of Limits

- Many limits cannot be evaluated by substitution.
- Most typical case is a “0 over 0”.
- Example:  $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$
- Solution: Perform algebraic manipulation to the function, without changing the value but eliminating the problematic part.
- In this example:  $\frac{x^2 - 4}{x - 2} = \frac{(x-2)(x+2)}{x-2} = x + 2$
- We were able to eliminate the term  $x - 2$ , which was the one causing the zeros.

When dealing with limits that cannot be evaluated directly:

- Perform algebraic transformations until the problematic terms go away.
- Evaluate limit of resulting expression by substitution/plugging in.
- Other examples:
  - $\lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4}$ . Use “conjugate”.
  - $\lim_{x \rightarrow 1} \left( \frac{1}{x - 1} - \frac{2}{x^2 - 1} \right)$  ( $\infty - \infty$  form). Make common denominators.
  - $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan x}{\sec x}$ . Write in terms of sin, cos.