Strategies to compute $\lim_{x\to a}\left[\frac{f(x)}{g(x)}\right]$

1. Try plugging in the value.
   If denominator ≠ 0, done!
2. **If denom = 0 & numerator ≠ 0**,
   the answer is -∞, +∞ or DNE. Examine the sign of the output from each side.
3. **If denom = 0 & numerator = 0**,
   Use algebraic methods discussed in class to simplify and cancel until one of them is not zero.

Here is a summary of algebra methods we discussed for the 3rd case:
Strategy 1: Factor/Cancel
Strategy 2: Simplify Fractions
Strategy 3: Expand/Simplify
Strategy 4: Multiply by Conjugate

Strategy 5: Change Variable (Optional)
Strategy 6: Compare to other functions (Squeeze Thm)

Special note:
If the problem starts as two fractions, combine them into one.

Strategies to compute $\lim_{x\to\infty} f(x)$

1. Is it a known limit?

$$\lim_{x\to\infty}\frac{1}{x^a}=0, \qquad \text{if } a>0$$

$$\lim_{x\to\infty}e^{-x}=0\ ,\ \lim_{x\to\infty}\ln(x)=\infty\ ,\ \lim_{x\to\infty}\tan^{-1}(x)=\frac{\pi}{2}$$

2. Use algebra to rewrite it in terms of known limits:

Strategy 1: Multiply top/bottom by $\frac{1}{x^a}$, where *a* is the largest power.
Strategy 2: Multiply top/bottom by e^{-rx}.
Strategy 3: Multiply by conjugate.
Strategy 4: Combine Fractions.

Special note:
If there is a radical you may have to rewrite *x* under a radical.
If *x* is positive, then $x=\sqrt{x^2}$.
If *x* is negative, then $x=-\sqrt{x^2}$.