1 | Solving Limits with Elimination

With solving limits via elimination, we are tipically analyzing a rational function that needs factoring of a term out of the polynomials on the top and/or the bottom to get out of the indeterminate form $(\frac{0}{0})$.

- Try factoring both the top and bottom
 - $-(x\pm 1)$
 - $-(x\pm 2)$
- · Rationalize all of the square roots

Tip for picking factors

Tip! If you plug in a value to an expression, and out pops 0, that value is a **zero** of the expression. It is helpful like this

Factor:
$$(x^6 - 1)$$

As you could see, plugging x=1 yields 0, meaning that (x-1) is a **zero** of (x^6-1) , and hence would be able to be factored out.

To factor it out, either do synthetic division or long division.

Let's do a problem solve for $\lim_{x\to 2}\frac{(x^2-4)}{(x-2)}$

- 1. First, notice the fact this function will have a hole at x=2. This is especially important because after we simplify we will loose this hole.
- 2. Ok, now let's simply. $\frac{(x^2-4)}{(x-2)} = \frac{(x+2)((x-2))}{(x-2)} = (x+2)$
- 3. Great! So, we know that this function behaves linearly with simply a hole at 2.
- 4. Doing the double-sided limits...
 - Evaluating $\lim_{x\to 2^+}$, the value will be 4 because 2+2=4.
 - Evaluating

Here's another one! $\lim_{x\to 0} \frac{\sqrt{x+4}-2}{x}$

- 1. First, notice that if we are going to solve this problem, we have to divide the top thing $(\sqrt{x+4}-2)$ by x, somehow
- 2. The only thing we could do here is rationalize the top by multiplying the whole faction by a fancy one $\frac{\sqrt{x+4}+2}{\sqrt{x+4}+2}$.
- 3. This results in $\frac{x+4-4}{x\times(\sqrt{x+4}+2)}$, which simplifies to $\frac{x}{x\times(\sqrt{x+4}+2)}$
- 4. Plugging in x = 0, you get $\frac{1}{4}$.

If there is no factors, you got yourself a vertical asymtote. Refer to #missing #disorganized for solution!