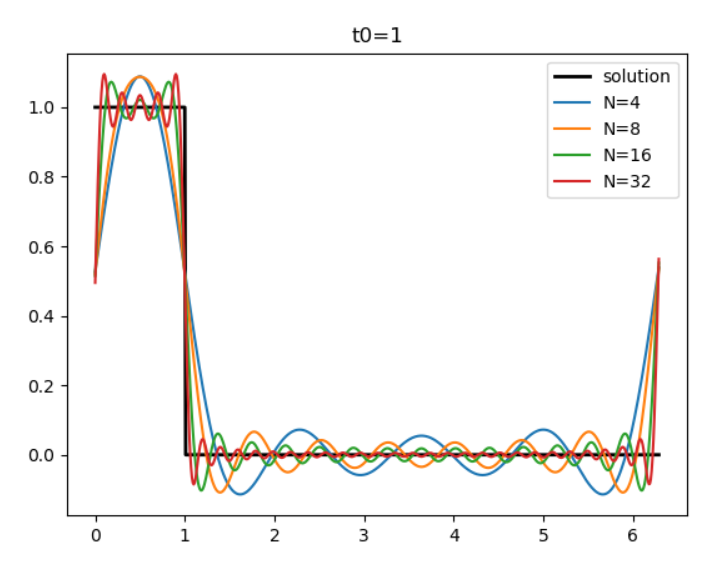
**TYLER GABB**

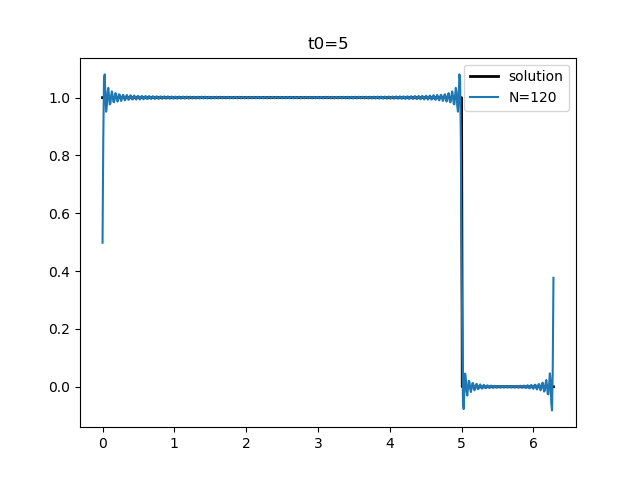
**HOMEWORK 3**

**Q1:**

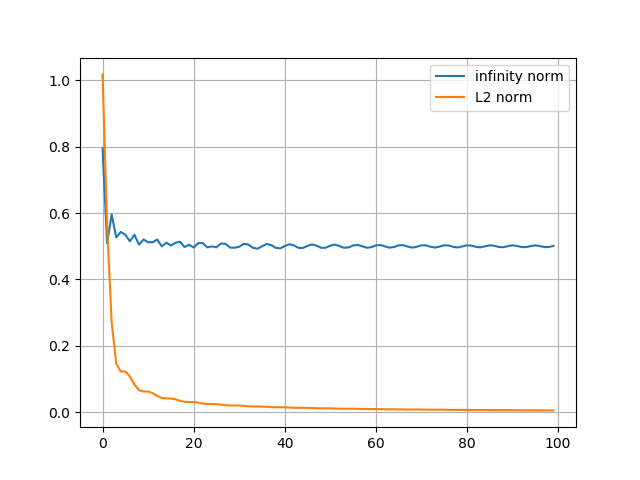
The arithmetic involving the validity of the formula is in the attached file [Analysis.pdf](Q1_Formula_6_Verification.pdf).

Below is the plot requested



 I notice that the solutions are periodic over the interval . End points are tied to for some n in the non-negative integers, no matter how many terms were summed to find the solution.

As you can see there is still a bit of overshoot even for N = 120, and it appears that no matter where the discontinuity is, the endpoints of the function are always tied to .

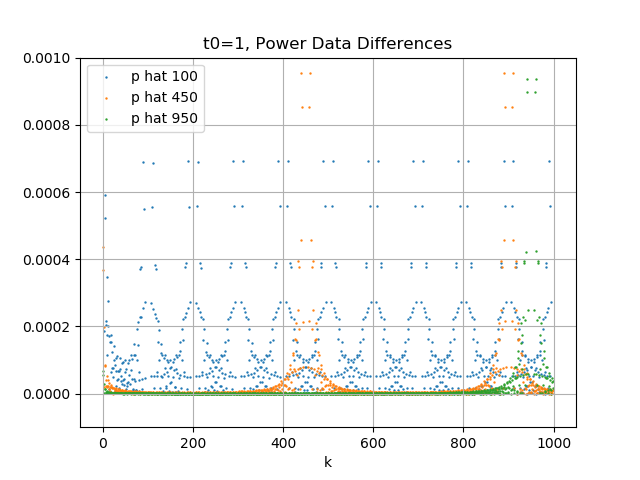
**Q2:**

To the right is a plot overlaying the infinity norm and L2 norms.

The infinity norm saturates to a value of 0.5 as which makes sense because the maximum of the error will always be 0.5 because of the behavior at the bounds of the interval.

It makes sense that the norm would decrease to zero as because it is like the area between the solution and approximated solution in the interval . As can be seen in the plots from Q1, more terms in the summation lead to a tighter approximation for the solution, which means less area between them.

I really wanted to carry these out analytically, however, I chose the easy route because I did not know where to start. I used Simpson’s rule for a given to approximate the integral for , and just enumerated for some partition of and found the maximum value programmatically for

**Q3:**

The above plot is a plot of as a function of . was found for values 100, 450 and 900. For higher values of the plot points stayed closer to zero for longer. For smaller values of , the periodicity property can be clearly seen. Smaller values of also cause the plot points to stay further away from the solution for longer.