Problem 5-39(v) we all had attempted and had trouble proving in class looks like this:

In[21]:= $f[x\_] := Sqrt[x^2 + 2 x] - x$

Demand that epsilon=0.001.

In[22]:= $epsilon = 0.001$

Out[22]=

0.001

That means that this thing has to be between 0.999 and 1.001.

I claim that $N = \dfrac{1}{epsilon} = 1000$ is sufficient.

Let's check by choosing an $x > 1000$, like 1001:

In[23]:= $f[1001.0]$

Out[23]=

0.999501

It worked! In fact, it is within 0.0005 of 1.

Also here is a graph of the function out to $x = 1000$.

In[24]:= $Plot[f[x], \{x, 0, 1000\}, PlotRange \to All]$

Out[24]=