(5)

Exercise 2.2.12

a. Our definition of a convergent seqwence that has a limit of zero requires, the seqwence to have the following property:

$$(\forall \varepsilon > 0)(\exists N)(\forall n \geq N)[\,|x_n - 0| < \varepsilon\,]$$

The provided arguement satisfies this reqwirement for only one ε, so we cannot call $x_n = (-1)^n$ a convergent seqwence with a limit of zero.

b. The arguement is valid, as it assumes $\langle x_n \rangle_n$ is evenlually less than some epsilon, and a contradiction is found. The assumption being wrong precludes this seqwence from being convergent with limit x by our definition.