

RHP
Jan 13, 2011

Hi Phil,

I'm still under unconscionable pressure for reports, grant proposals, university garbage, ..., but here I'll try to move our conversation forward.. a bit. I've become less sure that the answer to your question is yes. Part of this is that I am less sure of just what your question is.

Your proffered proof seems to me to be just a hiding behind some mystical mathematical patterns, partly because I don't understand just what you are writing. If you think that there's more to what you've written than has met my eyes, please clarify.

When you ask whether any $g(x)$ can be a Green's function, we need to figure out just what you mean. A Green function *must* have a discontinuous derivative, so any old $g(x)$ cannot work. I assume therefore that what you had in mind is a $g(x)$ that has something in it that is adjustable, some parameter or whatever.

Your question then becomes: can we find a Sturm-Liouville differential equation that can be satisfied by any particular adjustable $g(x)$ that we choose. One relevant statement is this: If you give me any fixed $g(x)$, I can find a second-order differential equation that is satisfied by that $g(x)$, and we can interpret that as a Sturm-Liouville system if we have the right boundary conditions. When I wrote to you that there exists a Green function for 1D, this is what I had in mind.

OK.. so, exactly what is your question?

Richard