

Accepted Manuscript

Eigenvalues of Periodic Sturm Liouville Problems

Yaping Yuan, Jiong Sun, Anton Zettl

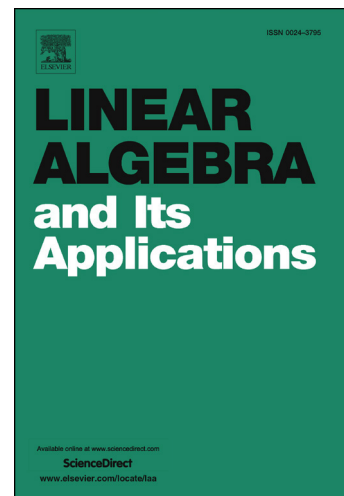
PII: S0024-3795(16)30561-4
DOI: <http://dx.doi.org/10.1016/j.laa.2016.11.035>
Reference: LAA 13952

To appear in: *Linear Algebra and its Applications*

Received date: 7 September 2016
Accepted date: 22 November 2016

Please cite this article in press as: Y. Yuan et al., Eigenvalues of Periodic Sturm Liouville Problems, *Linear Algebra Appl.* (2017), <http://dx.doi.org/10.1016/j.laa.2016.11.035>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



Eigenvalues of Periodic Sturm Liouville Problems

Yaping Yuan, Jiong Sun, and Anton Zettl

ABSTRACT. For h -periodic coefficients and any integer $k > 2$ it is well known that the eigenvalues of some self-adjoint complex boundary condition on the interval $[a, a+h]$ are the same as the periodic eigenvalues on the interval $[a, a+kh]$. For each k we identify explicitly which of the uncountable number of complex conditions generates these periodic eigenvalues. In addition, we prove an analogous result for semi-periodic eigenvalues.

1. Introduction

We study eigenvalues of the equation

$$(1.1) \quad -(py')' + qy = \lambda wy, \quad \lambda \in \mathbb{C},$$

with coefficients satisfying

$$(1.2) \quad 1/p, q, w \in L_{loc}(\mathbb{R}, \mathbb{R}), \quad p > 0, \quad w > 0 \text{ a.e. on } \mathbb{R},$$

and for some $h \in \mathbb{R}$, $0 < h < \infty$ the coefficients are h -periodic:

$$(1.3) \quad p(t+h) = p(t), \quad q(t+h) = q(t), \quad w(t+h) = w(t), \quad t \in \mathbb{R};$$

together with the complex boundary conditions

$$(1.4) \quad \begin{aligned} y(a+h) &= e^{i\gamma} y(a) \\ (py')(a+h) &= e^{i\gamma} (py')(a), \quad 0 < \gamma < \pi \end{aligned}$$

and, for any $a \in \mathbb{R}$, the periodic and semi-periodic boundary conditions on the k -intervals $[a+kh]$, $k \in \mathbb{N}_1 = \{1, 2, 3, \dots\}$:

$$(1.5) \quad \begin{aligned} y(a+kh) &= y(a) \\ (py')(a+kh) &= (py')(a), \end{aligned}$$

$$(1.6) \quad \begin{aligned} y(a+kh) &= -y(a) \\ (py')(a+kh) &= -(py')(a). \end{aligned}$$

Note that condition (1.2) implies that the coefficients satisfy

$$(1.7) \quad 1/p, q, w \in L^1(J, \mathbb{R}), \quad p > 0, \quad w > 0 \text{ a.e. on } J,$$

1991 *Mathematics Subject Classification*. Primary 34B20, 34B24; Secondary 47B25.

Key words and phrases. boundary conditions, periodic, semi-periodic, complex self-adjoint.

This paper is in final form and no version of it will be submitted for publication elsewhere.

Download English Version:

<https://daneshyari.com/en/article/5773409>

Download Persian Version:

<https://daneshyari.com/article/5773409>

[Daneshyari.com](https://daneshyari.com)