NOTES ON NONLINEAR SPECTRA

NATALIJA SERGEJEVA

Daugavpils University

Parādes iela 1, LV-5400, Daugavpils, Latvia

E-mail: `felix@cclu.lv`

We investigate the asymptotics of Fučik spectra ([1, §*35.4*]) for the second order boundary value problem

$$x'' = -\mu^2 x^+ + \lambda^2 x^-, \quad x^+ = \max\{x, 0\}, \quad x^- = \max\{-x, 0\}, \tag{1}$$

$$x(0) = x(1) = 0. \tag{2}$$

We show that there exists a one-parametric family of equations of the form (1), which includes the eigenvalue problems.

Namely, the family of equations is given by

$$x'' + \pi^2 x^+ - (\pi\alpha)^2 x^- = 0, \quad \alpha \in (0, +\infty) \tag{3}$$

$$x'' + \left(\pi \frac{1-\beta}{\beta}\right)^2 x^+ - (\pi(1-\beta))^2 x^- = 0, \quad \beta \in (-\infty, 0) \tag{4}$$

$$x'' + \left(\pi \frac{2\beta+1}{\beta}\right)^2 x^+ - (\pi(2\beta+1))^2 x^- = 0, \quad \beta \in (0, +\infty) \tag{5}$$

$$x'' + \left(\pi \frac{2-2\delta}{\delta}\right)^2 x^+ - (\pi(2-2\delta))^2 x^- = 0, \quad \delta \in (-\infty, 0) \tag{6}$$

$$x'' + \left(\pi \frac{3\delta+2}{\delta}\right)^2 x^+ - (\pi(3\delta+2))^2 x^- = 0, \quad \delta \in (0, +\infty), \tag{7}$$

and so on. Each of the equations (3), (4),(5) and so on together with the boundary conditions (2) has a nontrivial solution. We give also the geometrical interpretation of this parametrization.

We consider also the third order boundary value problem [2]

$$x''' = -\mu^3 x^+ + \lambda^3 x^-, \quad x(0) = x'(0) = x(1) = 0. \tag{8}$$

REFERENCES

[1] A.Kufner and S. Fučik. *Nonlinear differential equations*. Nauka, Moscow, 1988. (in Russian)

[2] M. Gaudenzi and P. Habets. Fučik spectrum for a third order equation. *J. Diff. Equations*, **128** , 1996, 556 – 595.