

A Summary of Various SL Problems

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No.	SL Type	ODE	Boundary Conditions	Eigenvalues	Eigenfunctions	Range for n
1	Regular	$y'' + \lambda y = 0$	$y(0) = y(\pi) = 0$	$\lambda_n = n^2$	$y_n = b_n \sin(nx)$, $b_n \neq 0$	$n = 1, 2, \dots$
2	Regular	$y'' + \lambda y = 0$	$y'(0) = y'(\pi) = 0$	$\lambda_n = n^2$	$y_n = a_n \cos(nx)$, $a_n \neq 0$	$n = 0, 1, 2, \dots$
3	Periodic	$y'' + \lambda y = 0$	$y(-\pi) = y(\pi)$ $y'(-\pi) = y'(\pi)$	$\lambda_n = n^2$	$y_n = a_n \cos(nx) + b_n \sin(nx)$ $a_0 \neq 0$, $a_n^2 + b_n^2 \neq 0$	$n = 0, 1, 2, \dots$
4	Regular	$y'' + \lambda y = 0$	$y(0) = 0$ $y(\pi) + y'(\pi) = 0$	$\lambda_n = \frac{\mu_n^2}{\pi^2}$	$y_n = b_n \sin(\frac{\mu_n x}{\pi})$ $b_n \neq 0$	μ_n is nth positive root of $\tan(\mu) = -\frac{\mu}{\pi}$ $n = 1, 2, \dots$
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