ÇANKAYA UNIVERSITY

Department of Mathematics

# Solve It

## - 10 -

Published Date: 03.04.2026

Deadline: 17.04.2026

Convert the following second-order differential equation

$$((p(x)y^{'})^{'} + q(x)y = 0, x \in [a, b],$$

where $p(x) > 0$, $p(x), q(x)$ are real-valued continuous functions on $[a, b]$, to the following first-order differential equations

$$\theta^{'}(x) = \frac{r(x)}{p(x)} cos^2\theta(x) + q(x)sin^2\theta(x),$$

$$r^{'}(x) = r(x)(\frac{1}{p(x)} - q(x))sin\theta(x)cos\theta(x).$$

using the Prüfer phases

$$y(x) = r(x)sin\theta(x),$$

$$(py^{'})(x) = r(x)cos\theta(x).$$