Report on Analytic Solution for Annular Ducts

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1 Current Research Direction

The goal is to currently compute the coefficients A and B, the weighting factors for the Bessel Functions for the first and second kind. V072 contains FORTRAN subroutines that compute these along with the Bessel functions.

2 Research Performed This Week

There are four subroutines

- `eigen.f`,

  Computes the weighting factors, A and B for the radial mode shpe

- `besj.f`,

  Computes the bessel functions of the first kind and their derivatives of positive or zero order, n, and zero or positive argument x

- `besy.f`, and

  Computes the bessel function of the second kind and their derivatives of positive or zero order, n, and zero or positive argument x

- `rmode.f`.

  Calculate radial mode shape psi for the (m,n) radial mode of an annular duct

3 Issues and Concerns

After reviewing C.S. ventres,et al., "Turbofan Noise Generation", NASA-CR-167951,July 1982, the input to `eigen.f` needed to be non-dimensional. The value of the duct mode radial eigenvalue needs to be multiplied by the radius as directed. $m = 0$ $r_{min} = 0.2$ $r_{max} = 1$ $A = 1.0432423009108394$ $B = 3.123012599045477E - 02$ $\kappa_{mn} = 0.2$

4 Planned Research

I need to comppare against a SWIRL result, however when extending r_{max} to 10 the result looks pretty close to J_0

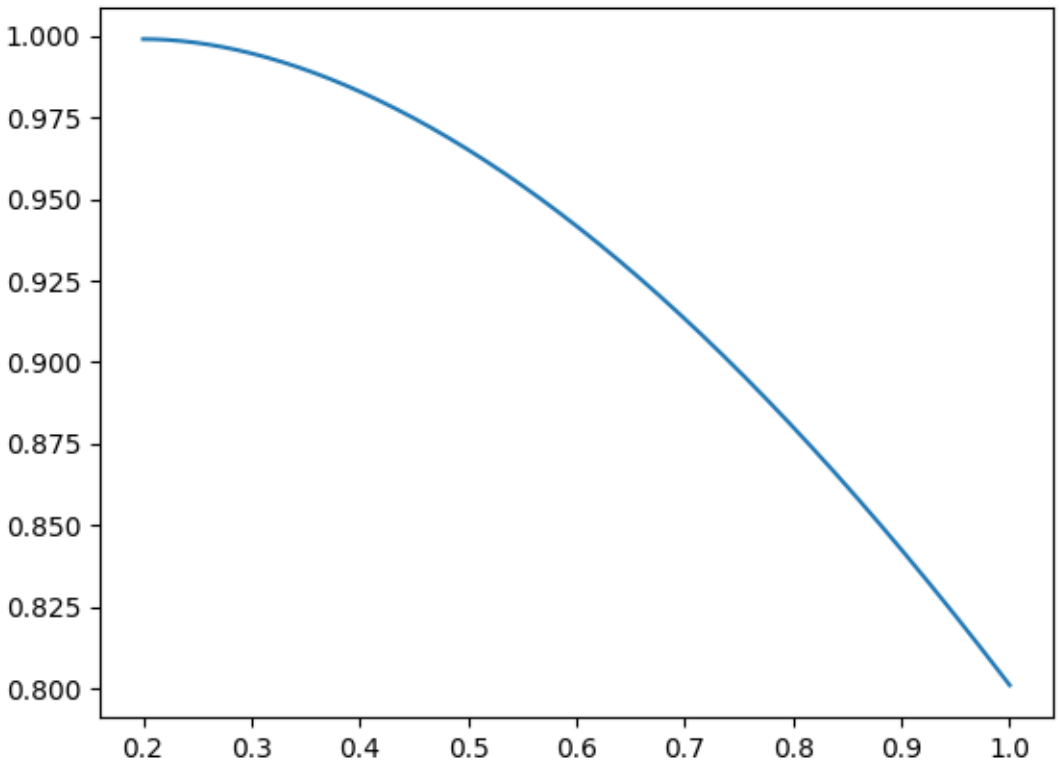

Figure 1: Trial 1

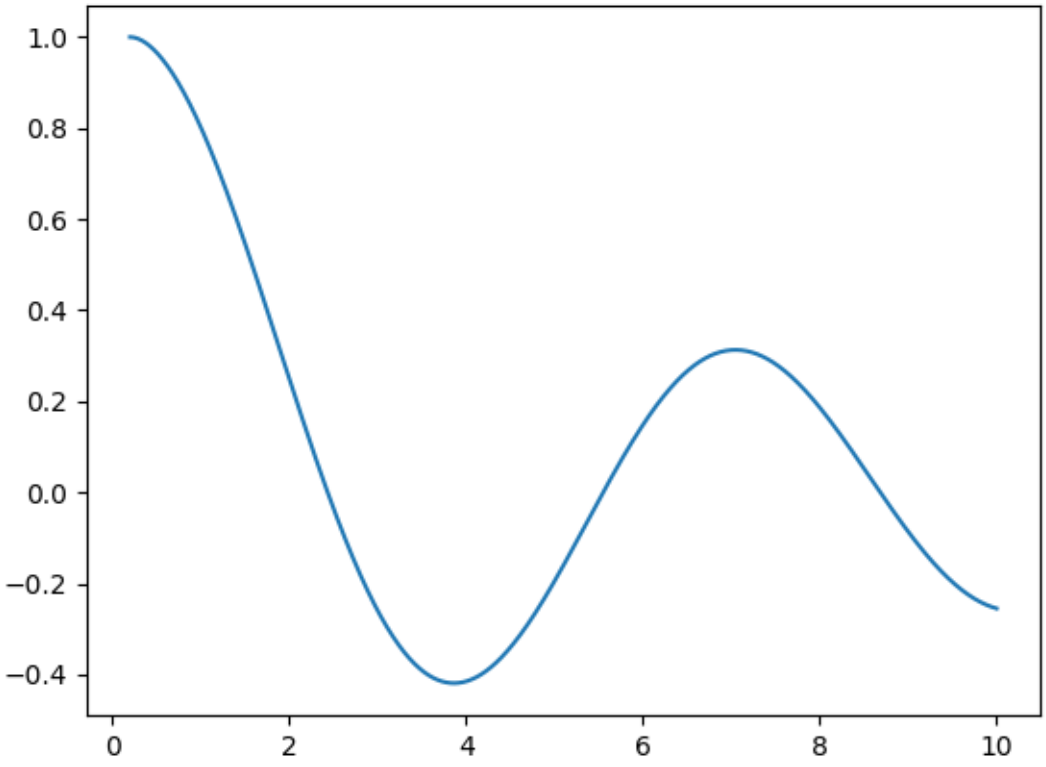

Figure 2: Trial 1