

Find eigenvalues $c = \pm a_0$ and eigenvectors $L = (\pm a_0, \rho_0)$

Write in characteristic form and solve.

Solution superposition of two waves: left and right going sound waves.

Get form

$$(u + (a_0/\rho_0)R)_t + a_0(u + (a_0/\rho_0)R)_x = 0,$$

$$(u - (a_0/\rho_0)R)_t - a_0(u - (a_0/\rho_0)R)_x = 0.$$

Thus:

$$u + (a_0/\rho_0)R = f(x - a_0 t),$$

$$u - (a_0/\rho_0)R = g(x + a_0 t).$$

So:

$$u = (1/2)[f(x - a_0 t) + g(x + a_0 t)],$$

$$R = (\rho_0/(2a_0))[f(x - a_0 t) - g(x + a_0 t)],$$

$$P = (a_0/2)[f(x - a_0 t) - g(x + a_0 t)],$$

where $P = (a_0^2/\rho_0)R$ is the pressure perturbation.

Review of Gauss/Stokes Theorem and implications for solvability of:

When is $u_x + v_y = 0$ equivalent to $\psi_x = v$ and $\psi_y = -u_x$?

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18.311 Principles of Applied Mathematics
Spring 2014

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