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function error = freqEq(omega,k)

% Function used to find the natural frequencies of a
% string that has one end rigidly attached to the musical
% instrument but the other end attached to a flexible
% strip.
%
%
% Input:
%   omega: The natural frequency in radians
%   k:     The bending flexibility of the strip
%   Both are suitably nondimensionalized in a way not
%   important here.
%
% Output:
%   error: If error is zero, then the frequency is a
%   valid one for that value of k. Note that a
%   string can vibrate with infinitely many
%   frequencies (theoretically at least)
%
% Advanced analysis taught in Analysis in Mechanical
% Engineering II shows that the equation the frequencies
% must satisfy is:
%           - k omega = tan(omega)
% However, the tan is infinite at any odd amount of pi/2,
% and that is a numerical problem. So we multiply both
% sides by the cosine:
%           - k omega cos(omega) = sin(omega)
% Then if the frequency is not right, the error in the
% equation (difference between the right and left hand
% sides) is:
%           error = sin(omega) + k omega cos(omega)

% Note that omega is in radians and do not forget the semi-colon
error = sin(omega) + k*omega*cos(omega);

end

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