

UNIVERSITY OF NOTRE DAME
DEPARTMENT OF AEROSPACE AND MECHANICAL ENGINEERING

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Unsteady Aerodynamics and Aeroacoustics
AME-9034

HOMEWORK 2

1. It is shown in the book Aeroelasticity (p.529) that for an airfoil in rotational oscillation, a necessary condition for flutter to occur is that the out-of-phase component of the aerodynamic moment must vanish. Show how this condition depend on the center of rotation by deriving the expression for the unsteady lift for a rotational oscillation around a point x_0 . Plot on a vector diagram for this unsteady lift for $x_0 = 0, -.25, -.5, -1, -2$.
2. Show that this condition is equivalent to the work per cycle $W=0$.
3. Plot on a vector diagram the Sears, Wagner and Küssner functions. Examine the accuracy of the approximations to theses functions.