



AUBURN UNIVERSITY

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COLLEGE OF ENGINEERING

AEROSPACE

AERO 4970/7970

Advanced Perturbation Methods
Asymptotic Expansion of Integrals

SET VIII

1. Use the Integration-by-parts Method to obtain an asymptotic expansion for:

$$\begin{cases} E_1(x) \equiv \int_x^\infty \frac{e^{-t}}{t} dt; & x \gg 1 \\ I(x) = \int_x^\infty \frac{\cos t}{t} dt; & x \gg 1 \end{cases} \quad (1)$$

2. Use Watson's Lemma to obtain an asymptotic expansion for:

$$I(x) = \int_0^1 e^{-xt} \ln(1+t) dt; \quad x \gg 1 \quad (2)$$

3. Determine the first two terms of the asymptotic expansion for:

$$I(x) = \int_0^1 \frac{e^{-xt}}{\sin^2(t^{1/3})} dt; \quad x \gg 1 \quad (3)$$

4. Use Laplace's Method to find the leading term in the asymptotic expansion for:

$$\int_0^\infty e^{-x(t^2-2t)} (1+t)^{5/2} dt; \quad x \gg 1 \quad (4)$$