1 (Holmes; 2013, 4.2)). Consider
\[ y'' + k^2(\epsilon t)y = 0, \quad y(0) = a, \quad y'(0) = b. \]
Make the change of variables \( \tau = \epsilon t \) and then use the WKB method to construct a first-term approximation of the solution. Compare this result with that obtained using multiple scales.

2 (Holmes; 2013, 4.4). Consider \( \epsilon^2 y'' - q(x, \epsilon)y = 0 \).
(a) Make the substitution \( y(x) = e^{w(x)} \). What equation does \( w \) satisfy?
(b) Suppose that \( q(x, \epsilon) \sim q_0(x) + \epsilon q_1(x) \), where \( q_0 \) is nonzero. Assume \( w \sim \epsilon^a (w_0(x) + \epsilon^b w_1(x) + \cdots) \), find the first two terms in the expansion.
(c) Suppose that \( q(x, \epsilon) \sim \epsilon q_0(x) + \epsilon^2 q_1(x) \), where \( q_0 \) is nonzero. Find the first two terms in the expansion for \( w \) and determine the resulting expansion for \( y \).