Math 207C
Homework 1
Due Friday, April 8th

1. Find the two-term asymptotic expansion for small ϵ for all real roots x of the below equations.

   (a) $\epsilon^2 x^3 - x + \epsilon = 0$

   (b) $\epsilon \exp\left(x^2\right) = 1 + \dfrac{\epsilon}{1+x^2}$

2. The Exponential integral function is defined as

$$Ei(x) = \int_x^\infty \frac{\exp(-s)}{s} ds.$$

   Derive an asymptotic expansion for $Ei(x)$ for large x. Use a computer (e.g. expint(x) in MATLAB) to check the accuracy of your expansion for different values of x and for different numbers of terms. Discuss your results.