BIL108E **Introduction to Scientific and Engineering Computing**

Lab 3

1. Calculate the following summation with user input *n,* and plot *S* versus *k* graph.

$$s = \sum_{k=0}^{n} \frac{1}{k^2 + 1}$$

2. A function that classifies a flow according to the values of its Reynolds (Re) and Mach (Ma) numbers, such that if Re < 2000, the flow is laminar; if 2000 < Re < 5000, the flow is transitional; if Re > 5000, the flow is turbulent; if Ma < 1, the flow is sub-sonic, if Ma = 1, the flow is sonic; and, if Ma >1, the flow is super-sonic. Write an m-file classifying the flow according to its Reynolds and Mach numbers.

3. In one of your calculus classes you probably learned that sin(x) can be expanded in a power series, $\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + -\ldots$. Compare sin x to the first two and first three terms of this expansion for x = 0.01, 0.1 and 1.

4. In what follows, the value p_n should approach π. Let $p_2 = 2\sqrt{2}$, and

$$p_{n+1} = 2^n \sqrt{2\left(1 - \sqrt{1 - \left(p_n / 2^n\right)^2}\right)}$$

compute p_n for n = 3, 4,….., 20 by the above formula. Plot the absolute error versus n graph.