Homework 2, Math 451, Spring 2013

due Wednesday, January 30th

This home covers material from Sections 2.1-2.4 of Mathews and Fink.

- **Book problems**
  - Section 2.1, problem 1
  - Section 2.1, problem 2
  - Section 2.1, problems 5
  - Section 2.4, problems 1
  - Section 2.4, problems 3

- **Non-book problems**

  1. Use the bisection algorithm to find the values of $x$ in the interval $(-\pi, \pi)$ where the function
     \[ f(x) = \sin\left( x + \frac{\text{sign}(\cos(10x))}{2} \right) - \frac{4}{10} \]
crosses $f(x) = 0$. In this case, we will count jumps as crossings. Your solutions should be accurate to 6 decimal places. (Note that neither fixed-point iteration or Newton–Raphson can solve this problem, as stated.)

  2. Consider the equation
     \[ e^{rx} = x^2. \]

     Fill in the blanks:
     In this equation, there may be as few as ______ solutions, or as many as ______ solutions, depending on the value of $r$. If $|r| > ______$, then there are ______ solutions. Solutions are found in the interval(s) _________________.
     If $|r| < ______$, then there are ______ solutions. Solutions are found in the interval(s) _________________. In between these two cases, there are ______ solutions, which are _________________.

     Now, explain how you determined your answers.