Read BF Chapter 2.3, 2.4, 2.5

Exercises

Chapter 2.3 # 1, 3, 5b*, 7b*, 13, 23
* If you need more practice, do any additional parts of 5, 6, 7, 8.

Chapter 2.4 # 7, 8, 9

Chapter 2.5 # 1c, 17

MATLAB/Octave

1. Write a function `secant` that takes a function f and initial approximations p_0 and p_1, and solves $f(x) = 0$ using the secant method.

2. Newton's method works with complex numbers as well. In this problem, $f(x) = x^3 - 1$.
   (a) Find (by hand) the three roots of $f(x)$.
   (b) If you start Newton's method with a real number, the iterates stay real and only real roots are found. If you start with a complex number, complex roots might be found. Using Matlab, fill out the table below, showing which root of f Newton's method finds for various starting values x_0.

x_0:	2	i	$-i$	$1+i$	$0.3+0.5i$
Root found:					

   (c) Make a plot, using MatLab, that shows which root of f is found for a mesh of complex numbers $x + iy$, where $-1 \le x \le 1$ and $-1 \le y \le 1$. Print your image.
   Some help for this part:
   - Create matrices of `x` and `y` values using `meshgrid`.
   - Apply the `newton.m` function from class to every element of the matrix `x+iy`. You can do this with a loop, or by changing `newton.m` so it works on matrices, which is easy: alter the code so it always runs a fixed number of steps.
   - Use `pcolor` to plot the resulting roots. The roots are complex numbers, but you can convert them to real numbers with the `angle` function. You'll want to set `shading flat` after plotting to erase the black lines of the grid.