Here are some sample questions from old tests. Some topics that we covered are not represented by these questions, but are still fair game.

- 1. Give MATLAB commands to plot the function  $f(x) = x^2 5$  on the interval [0, 8].
- 2. The function  $f(x) = x^2 5$  is continuous and f(0) < 0 < f(8), so it has a zero on the interval [0,8]. Perform 3 iterations of the bisection method to narrow down this interval.
- 3. Write a MATLAB function program to do n steps of the bisection method for a function f with starting interval [a, b]. Let f, a, b and n be the inputs and the final x be the output. Include comments.
- 4. For  $f(x) = x^2 5$ , do 2 iterations of Newton's method, starting with  $x_0$  as your best estimate from problem 2.
- 5. Write a MATLAB function program to do Newton's method for a function f until |f(x)| < tol. Let f, f',  $x_0$  and tol be the inputs and the final x be the output. Include comments.
- 6. (a) We can approximate  $\sqrt{2}$  by setting  $f(x) = x^2 2$  and solving for  $f(x^*) = 0$ . A reasonable starting guess is  $x_0 = 1$ . Do two iterations of Newton's method to get a better approximation for  $\sqrt{2}$ .
  - (b) Write a MATLAB function with inputs z and tol that computes  $\sqrt{z}$  to tolerance tol using Newton's method, and returns the result. Include comments. (It is illegal to use sqrt in your program.)
- 7. List your 10 least favorite Matlab commands.
- 8. Write a MATLAB function program that calculates the sum of the squares of the first n integers.
- 9. For  $f(x) = x^2 5$ , do 2 iterations of Newton's method, starting with  $x_0 = 2.0$ . What is the relative error of  $x_2$ ? About how many more steps would be needed to make the error less than  $10^{-16}$ ?
- 10. Write a MATLAB program to do n steps of Newton's method for a function f with starting interval [a, b]. Let  $f, f', x_0$  and n be the inputs and the final x the output.
- 11. For  $f(x) = x^2 5$ , do 2 iterations of the bisection method, starting with [a, b,] = [2, 3]. What is the relative error? About how many more steps would be needed to make the error less than  $10^{-6}$ ?
- 12. Write a function program which will find the roots of a function f on an interval [a, b].