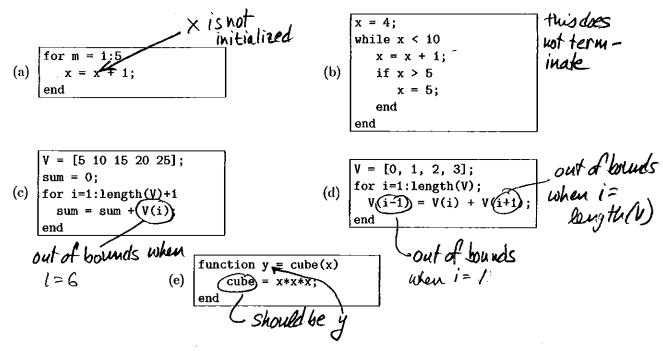
0 + name	(Note: This is worth 2 points if done fully correctly. No partial credit.)
1	Your Name: Version a Key
2	
3	Section Time/Section #:/
4	Your TA's Name:
5	Version a
6	
total	<del></del>

Problem 1. [9 points] For each of the following situations, indicate the most appropriate kind of plot or graph.

- a. You have measured the buckling load of steel rods of various diameters, and you want to compare it with the theoretical load predicted by a well-known formula.
  - A bar chart with two bars for each diameter, showing the measured and predicted buckling loads for that diameter.
  - A scatter (x-y) plot showing measured values (x=diameter, y=load), and also showing a smooth curve of the formula for the predicted load at all diameters.
  - A set of pie charts, one for each diamter, showing what fraction of the rods of that diameter buckled at the predicted load.
  - A series of histograms, one for each rod diameter, showing the number of rods of that diameter that buckled at each load.
- b. You have surveyed CS 221 students about how much time they spent working on problem set 3, and you want to show the distribution of that time.
  - A scatter (x-y) plot showing individual points (x=number of students, y=amount of time).
  - A histogram with bar height indicating the number of students who spent each amount of time, with "buckets" of size one hour, from 0 up to the maximum of 12 hours.
  - A pie chart with a "slice" for each student, with the size of the slice indicating the amount of time that student spent.
  - A Pareto chart, with bars indicating the number of students who spent each amount of time, and a curve indicating the cumulative percentage of students who spent up to that amount of time.
- c. You want to compare monthly manufacturing output between 2009 and 2010.
  - A scatter (x-y) plot with individual points (x=month & year, y=number of units manufactured).
  - A histogram, with bar height indicating the number of months in the two-year span in which production was at a given level.
  - Two pie charts, each with 12 slices, showing the fraction of each year's output produced in each month.
  - A bar chart with bar height indicating number of units produced, with two differentcolored bars for each month, one for 2009 and one for 2010.

either

Problem 2. [25 points] Each box below shows the contents of a single MATLAB script, which will be executed with an empty workspace. Each script has at least one error. Indicate and explain all the problems.



Problem 3. [10 points] Write down the value of the variable V after the following script executes:

$$V = [1 \ 0 \ 2 \ 1 \ 3];$$

$$R = V;$$

$$for i=2:length(V)-1$$

$$R(i) = V(i-1)+V(i)+V(i+1);$$

$$R(i) = R(i)/3;$$
end
$$V = R;$$

$$P = [1 \ 0 \ 2 \ 1 \ 3]$$

$$P = [1 \ 1 \ 2 \ 3]$$

Problem 4. [16 points] Next to each root-finding method below, write the letters of all the characteristics (below) that apply to it.

Newton's Method

Bisection Method

Fixpoint Method \_\_\_\_\_\_\_

MATLAB's roots() function

[a],c,f,g

- a. Guaranteed to converge.
- b. Diverges if magnitude of the slope of the function exceeds 1.
- c. Only works with equations involving polynomials.
- d. Requires knowledge of an interval containing at least one root.
- e. Diverges if the slope of the slope of the function is close to zero.
- f. Does not require any initial guess.
- g. Returns all roots.

Problem 5. [20 points] Consder the following sequence of MATLAB commands:

A = [1 2 0; 2 4 5; 3 -1 7]; B = [1 0 0; 0 1 0; 0 0 1]; C = [2 1; 9 5; 3 7]; D = [1 3; 2 5]; E = [1 7; -1 3]; F = [10 20 30; 100 200 100];

Compute the results of the following MATLAB commands. If the operation is not defined for the given operands, write "error".

a. 
$$A + B$$
 [2 7 0; 2 5 5; 3 -1 8]  
b.  $A - C$  error  
c.  $D * E$  [-2 16; -3 29]  
d.  $C' + F$  [12 29 33; 101 205 107]

$$\begin{bmatrix} 71 \\ 95 \\ 37 \end{bmatrix} = \begin{bmatrix} 793 \\ 157 \end{bmatrix}$$

Problem 6. [10 points] Partial code for a MATLAB implementation of the bisection method is below. Fill in the blanks with the correct code. (Note: the code assumes that initially f(xlow) and f(xhi) have opposite signs.)